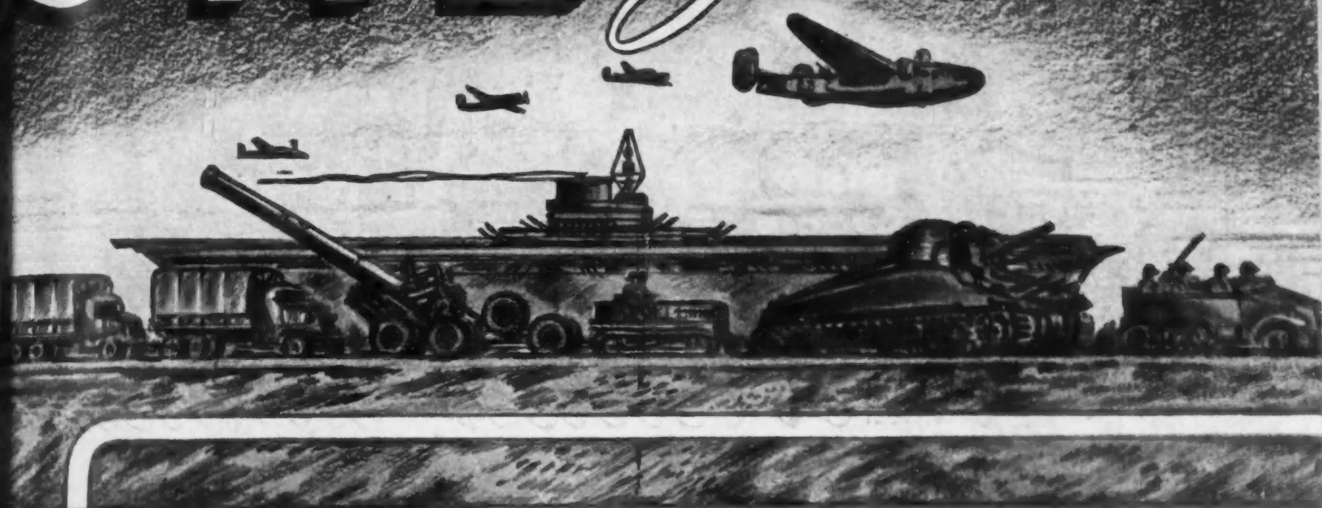
S·A·E Journal



JUNE 1944

SOCIETY OF AUTOMOTIVE ENGINEERS

SAE JOURNAL *Pre-Prints*

THE SOCIETY OF AUTOMOTIVE ENGINEERS, INC.
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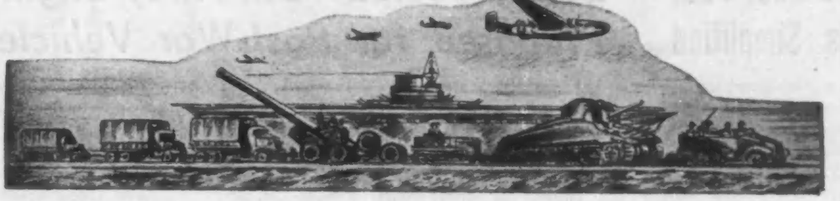
News of the JULY *Issue*



By Norman G. Shidle

"Material" and "Materiel"

THE engineer who sometime or other hasn't argued about the meaning and/or spelling of the words material and materiel is as rare as a Communist in a Union League Club. With an SAE Materials Meetings Committee helping to prepare programs for SAE War Materiel Meetings, the *SAE Journal* maintains a special Department for Prevention of Typographical Errors devoted exclusively to toying with these ticklish terms.

But finally our troubles are over. The AAF has come to the rescue with a statement to end all statements about this magnificent muddle.

Pointing out that the French word "materiel" was taken up by the U. S. Armed Forces following World War I, the AAF Materiel Command states categorically that:

Materiel is used to cover finished products; completed assemblies ready for battle. (Materiel is a plural word.)

Material is intended to mean raw materials which go into the makeup of the materiel.

The significant word in the definition, observes one of our analytical associates, is "finished".

Let's hope, that as regards this whole discussion, "finished" is not only significant but prophetic.

Thrust Meter Facilitates Flight Testing of Planes

PERSISTENT endeavors of engineers to develop foresight comparably related to hindsight has produced, among other results, a meter which measures the thrust horsepower of an airplane in flight.

Given thrust horsepower, the engineers contend they can estimate horsepower required. With both x and y known, they presume to compute a plane's performance.

The thrust meter still is struggling to emerge from the cocoon of experimentation. Its use requires a photo-observer, plus airspeed indicator, tachometer, altimeter, OAT, bmep gage, manifold pressure gage, thrust meter pressure gage, intershaft pressure gage, gyro inclinometer, pitch indicator, clock, counter, tel-light, attention light, and, of course, a full complement of engineers.

However, the extent and variety of this galaxy of gadgets, of which, reputedly, only thrust meter, pitch indicator, and gyro inclinometer are nonstandard, should deter none from reading, in July *SAE Journal*, the story of the thrust meter's development and of its many possible applications. The story will be told by George W. Brady, of Curtiss-Wright Corp., Propeller Division, from personal experience.

Air Cargo Progress Awaits Solution of Technical Problems

AIR cargo transportation, widely heralded as a potential post-war big-business baby, probably will be a wonderful child, but the realities tend to make the diaper stage disillusioning.

There is little doubt that cargo planes will navigate the post-war air on a larger scale. The fact that parcels as well as people can be flown requires no new proof. But one of the headaches of commercial air cargo operation is that economics sets in before novelty wears off.

It is becoming painfully evident that considerable time must pass and engineering work be done before economic evolution makes air cargo commercially practicable. Groundling bogies, such as volume of traffic and cost of operation, bedevil the business. If costs can be pushed down and volume up, air cargo's speed and convenience will make it pay. However, there are additionally annoying factors, such as volume density, lost time in handling, and countless others.

Realistic description of some of the economic boot straps by which air cargo must lift itself, and of the cross-current influences of the various factors, will be presented in July *SAE Journal* by Carlos Wood, chief, Preliminary Design Section, Douglas Aircraft Co., Inc.

While Mr. Wood's article will be concerned primarily with the design of air cargo planes, it will suggest that in the air cargo business there are few, if any, unrelated factors.

COOPERATION OF ENGINEERS SOUGHT TO END VAPOR LOCK DANGERS IN TANKS, PLANES

ILLUSTRATIVE of engineering controversies inherent in the progressive development of anything so complicated as a self-propelled vehicle is the peripatetic problem of vapor lock.

A decade or so ago it developed in the midsummer crop of new model passenger cars. The buyer went for a drive, then for a telephone. That new car, suddenly and inexplicably, had stalled. By the time the repair truck had arrived, the owner was boiling and the engine was cool. It started and ran as smoothly as the advertising – until the next hot day.

Vapor locking is an automotive malady somewhat akin to human "burps." The fuel boils in the feed line, somewhere between tank and engine. The resulting vapor blocks flow of liquid gasoline. The engine quite naturally stops. When engine and fuel line cool, the liquid flows again, and the engine starts – without adjustments or repairs.

Overheated Plumbing

The basic cause appears to be overheated plumbing, or highly volatile gasoline, depending upon whether the debater is in the automotive or oil business. Design and production engineers blame the gasoline. Refining engineers blame the plumbing.

The situation began to transcend the rostrum recently. Vapor locking made sitting ducks of military tanks, and forced high-flying combat planes down into the flak area. With a war going on the main job was to end vapor locking rather than the argument.

"Dumb Engineering"

July *SAE Journal* will tell the whole story, and some causes and cures, in an engineering, but none the less salty, treatise by R. J. S. Pigott, of Gulf Research & Development Co. He will ascribe vapor lock fundamentally to "dumb engineering"; also he will present technical data designed to show exactly how vapor locking can – and should – be prevented. And he will give some nontechnical advice from which anyone can get the general idea, such as:

". . . Almost any experienced drinker knows enough not to suck Vichy through a straw, unless intending to produce 'burps' with a truly professional aplomb. Therefore, we ought not to try and boil gasoline in the tank before starting to suck on it by means of a fuel pump at the end of a long straw, usually carefully arranged with knots in it."

Multi-Cylinder Diesel Fuel Injection Pumps Simplified

TREND toward simplicity in diesel accessories design is shown in the development of a single-plunger injection pump for multi-cylinder diesel engines. Its development and design, construction, and operating details will be described in July *SAE Journal* by Raymon Bowers and R. E. Peterson, of International Harvester Co.

They will say the pump, developed by four years of experimentation and pre-production test throughout the country, has advantages of simplified construction, precision fuel metering, and ease of control.

The flange-mounted, gear-driven, completely enclosed pump will be described as metering fuel in basically the same way as the conventional multiplunger design and as delivering the fuel to the engine through a distributing system comprising four cam-operated valves. Control is by flyball governor which, through simple linkage, rotates the plunger in its barrel.

Fuel filter equipment will be said to prevent excessive wear, and uniform fuel delivery to be assured at all operating speeds and settings by using bypass valve and spring on the supply pump side of the plunger unit assembly. Exhaust smoke, ascribed to fuel dribbling, will be said to have been corrected by installing a reverse check valve to relieve pressure in the injection line.

Direct-Cooled Tuck-Away Engine Proposed for Post-War Vehicles

WARTIME experience with tanks and planes, augmented engineering knowledge, and a bit of semantics are combining for the predicted post-war birth of direct-cooled engines for motor vehicles.

Behind the direct-cooled alias is the air-cooled engine which passed out of the passenger-car picture some 12 years ago. Except for isolated uses, such as in the Nazi "volkswagen," and in an American-made local delivery truck, which was just beginning to roll when rationing set in, the aircooled engine has enjoyed maximum use chiefly in tanks and planes.

This really is peak service which puts the direct-cooled engine's aluminum hat right in the middle of the ring, according to its prophets. Text of a resounding nominating speech by one of the more vocal, Chester S. Ricker, Detroit editor of "Aviation," will appear in July *SAE Journal*.

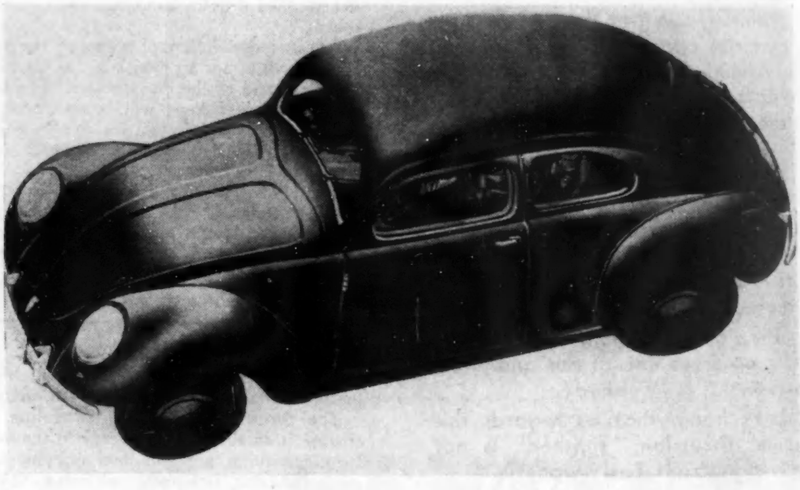
It will be no nostalgic plea for reconsideration of a bypassed style in engine design. Instead it will be a fighting plea for a fighting engine which, Mr. Ricker will insist, has proved its excellence under the most trying conditions and merits free and full consideration in its new and own right. It will be nominated for such positions as the rear-mounted powerplant of any land vehicle which requires the maximum power output per ton of weight, simplicity of servicing, maximum economy and efficiency.

Rear-mounting will be presented as no fixed requirement. Mr. Ricker will say the direct-cooled engine, actually requiring less air than its water-cooled competitor and far less plumbing, can be tucked virtually any place an air duct can reach. A 600% improvement in aircraft-engine cooling will be cited as a factor eliminating cobwebs and bugaboos which may have outlived some of the pre-depression decade's aircooled passenger cars. Use in tanks, the toughest, hottest service known, will be quoted as proving that the direct-cooled engine operates under superheated conditions.

Mr. Ricker will review technical literature and wartime engineering reports to show that the direct-cooled engine:

- Facilitates all-weather, year-round operation.
- Saves up to 40% in overall powerplant weight.
- Affords maximum fuel economies.
- Solves installation problems.

Rear-Mounted Direct-Cooled Engines Suggested for Post-War Cars



German "volkswagen," possible prototype of small, light, economical post-war cars (above), shows how long hood, covering spare tire and gasoline tank, can eliminate psychological disadvantages of rear-drive models

Survey Aeronautic Fields For Engineering Practice Applicable to Automobile

FEARS that post-war motor vehicles may simulate peas in monotonous design and construction readily can be dispelled by learning some of the ambitions, ideas, and proposals of automotive design engineers. War's sudden ending may produce a temporary epidemic of 1942 models, but after that means to the end of wartime shortage, the sky's the limit. In fact, automotive engineers appear to be keeping both eyes on the planes which fly that sky and to be preparing to adopt and to adapt aeronautic achievements to automotive uses on a wholesale scale.

There is a strong possibility, for instance, that post-war car buyers actually will be offered models powered by engines closely akin to those which power wartime planes. The process of adaptation will produce changes and improvements, and the potential buyers likely will be astounded by simplified design and construction.

Indeed, simplicity may be a post-war fetish. Effect on engines perhaps will be to eliminate radiator, cooling liquid, plumbing, and even the fan. Gone also perhaps will be poppet valves and related gadgetry. Gone some of the weight, oil consumption, fuel consumption, repairs, trouble, and much of the noise. Gone also, volume production permitting, some part of the cost.

However Utopian this may sound, the ideas will be supported by engineering data presented in July *SAE Journal* by J. P. Flannery, of Aircooled Motors Corp. Engineer Flannery will be telling chiefly about how to provide low-cost cylinder design for commercial airplane engines, but motor vehicle engine design also will be in the picture. There will be interesting suggestions for the post-war motor vehicle engine, such as aluminum, magnesium, and low-alloy-steel construction; jet cooling; sleeve valves; power with economy; strength without weight; reliability with low cost; prolonged operation without overhaul.

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JUNE 1944

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NEW *Hydrovac Braking* BY *Bendix*

On the road, Hydrovac delivers braking power at a pedal-touch . . . lets the driver accurately "feel" brake application . . . helps take the physical strain from driving . . . assures safe, smooth stops with any load.

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Hydrovac—latest and greatest power braking development—is no longer a postwar promise. *It's available right now* to qualified wartime users. And that's great news because there's *nothing* like Hydrovac for simplicity, dependability, and sheer braking ability. If you own or service hauling equipment, study this page—then see your Bendix dealer or write direct to Bendix Products Division, South Bend, Indiana. Don't trust war-vital carriers and loads to unsafe brakes. Get the best in power braking—Hydrovac by Bendix.

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Horizons of Diesel, Fuels, Lubricants ENGINEERING *Are Extended at Chicago SAE Meeting*

Capt. Lisle F. Small, USN, Navy Bureau of Ships, who spoke at the SAE National Diesel-Fuels and Lubricants Meeting Dinner, May 17, chatting with SAE President W. S. James, left, and H. S. Manwaring, chairman of the General Committee which staged one of the most successful joint meetings in the Society's history

NATURAL meshing of research and developments in diesel-engine and fuels and lubricants engineering was brought to dramatic fruition at the SAE National Diesel-Fuels and Lubricants Meeting, May 17 and 18 in Hotel Knickerbocker, Chicago.

"New Horizons in Diesel Engine Design" was keynoted as the theme of the meeting by Capt. Lisle F. Small, USN, Navy Bureau of Ships, and SAE President W. S. James, both of whom spoke to the capacity attendance at the dinner on the opening evening of the two-day meeting.

The captain declared that diesel engine development is still in its infancy, that it offers a field for brilliant achievements in fundamental research, and he challenged the engineers of the industry to coordinate their best efforts to keep American diesel engine design the world's best.

"As of October, 1943, the combined horsepower of diesel engines installed in Naval craft exceeded that of the steam turbines for the first time in the history of your Navy," he said.

"This is particularly significant because every time a capital ship or aircraft carrier is commissioned, over 200,000 hp in steam turbine output is added and 60,000 hp is added with each destroyer.

"I am glad to announce this interchange of rank in importance between diesel and steam powerplants amid you contributors to this accomplishment," the captain told his audience.

"Such current problems as the need for simplified treatment of torsional vibration, and standards of acceptable porosity in chrome-plated cylinder liners have been brought to your Society. I am happy to report your wholehearted cooperation through the SAE War Engineering Board," he continued.

President James, on behalf of the Society, accepted this challenge. He pointed out that the SAE was well organized to coordinate the research and development work of both the diesel engineers and the fuels and lubricants laboratories of industry from coast to coast. This has been done, and will be continued, through the SAE Diesel-Engine and the SAE Fuels and Lubricants Engineering Activities.

"Production of power," he said, "is the objective of both industries. Each affects the other.

"We face a period of development so fast and so vast that continued close liaison between these two great American industries will be essential," Mr. James said.

Highlight of the meeting was a wealth of discussion which followed the presentation of nine papers heard at the four technical sessions, two of which were planned and sponsored by the SAE Diesel-Engine Engi-

Planning Future SAE Diesel Engineering Meetings

During the SAE National Diesel-Fuels and Lubricants Meeting May 17 and 18 in Chicago, SAE Vice-President A. J. Blackwood met with his Diesel-Engine Engineering Activity Committee to plan forthcoming sessions at SAE national meetings. Standing, left to right are: Warren G. Brown (guest) and C. G. Rosen, Caterpillar Tractor Co.; A. W. Pope, Jr., Waukesha Motor Co.; W. F. Aug, Mack Mfg. Corp.; W. F. Joachim, U. S. Naval Engineering Experiment Station; Grover C. Wilson Universal Oil Products Co.; President W. S. James, Studebaker Corp.; M. M. Roensch, Chrysler Corp.; George M. Lange, Timken Roller Bearing Co.; A. L. Bayles, Rogers Diesel & Aircraft Corp.; W. A. Parrish, National Supply Co., and H. L. Knudsen, Cummins Engine Co.

Seated, left to right are: T. A. Bissell, SAE staff representative; W. S. Mount, Socony-Vacuum Oil Co., Inc.; F. G. Shoemaker, General Motors Corp.; Chairman Blackwood, Standard Oil Development Co.; H. S. Manwaring, Meetings chairman and General Committee chairman of the National Meeting, International Harvester Co.; B. Loeffler, American Bosch Corp., and P. M. Rothwell, Chrysler Corp.

neering Activity and two by the SAE Fuels and Lubricants Engineering Activity committees.

This incisive probing of technical problems yet to be solved was largely due to the efforts of Chairman H. S. Manwaring, of the General Committee for the meeting, and his colleagues who were responsible for the quality of the papers and the prepared discussions. This group consisted of W. G. Ainsley, meetings chairman of the Fuels and Lubricants Activity; E. R. Barnard, chairman of the SAE Chicago Section; SAE Vice-President A. J. Blackwood, for Diesel Engine Engineering; W. H. Oldacre, vice-chairman of the Chicago Section for Fuels and Lubricants; SAE Vice-President J. R. Sabina, for Fuels and Lubricants Engineering, and SAE Past-Vice-President Grover C. Wilson.

Diesel engineers and fuels technicians are thinking pretty much alike about the most direct routes to improvement of engine efficiency through better engineering of diesel piston designs.

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All papers presented at this SAE National Diesel-Fuels and Lubricants Meeting will appear in a later issue of the SAE Journal either in full in the Transactions Section or as digests

SAE Vice-Presidents J. R. Sabina and A. J. Blackwood (standing) with Rear-Admiral Harvey F. Johnson, engineer in chief, U. S. Coast Guard, and E. R. Barnard, chairman of the Chicago Section, hosts of the SAE National Diesel-Fuels and Lubricants Meeting. Messrs. Barnard, Sabina, and Blackwood were members of the General Committee

One fuels research engineer showed that the temperature of a piston built of low-conductivity material can be controlled by directing a jet of oil from the lubrication system onto the under side of the piston at an appropriate rate.

Then an engine man said that much of the radiant heat transfer occurs only during the part of the cycle when the flame is luminous – and that consequently the total amount of heat transferred by radiation from the gases to the piston is small as compared to that transferred by convection – the more important of the two processes.

It was brought out that the use of ribs properly dimensioned and located will improve the conductivity and distribution of heat in iron pistons. When properly correlated with actual engine operating conditions, static tests can be used to determine the heat flow and piston temperatures and, in turn, provide reliable data for piston design.

The piston temperature test bench for static tests reported upon was composed of a piston with rings, and had thermocouples installed at points to be checked. It was mounted in a regular cylinder sleeve surrounded by a short water jacket, through which water flowed at a measured rate. The piston head was heated by direct blast from an inverted gas burner. An electric heater and cooling coil in the lower tank of the setup held the circulating water to the required temperature. Thermopiles in the inlet and outlet water passages checked temperature differences at these points.

Engineers agreed that little has been accomplished toward materially cooling the piston head, although a great deal of engineering has been expended upon cooling that portion of the combustion chamber consisting of the cylinder head and walls.

Discussion disclosed that such research work as this indicated that lubricating oil jet cooling and a complimentary piston design are worthy of more intense engineering investigation, and should be fruitful in the united effort to improve engine output.

The audience was intrigued by the design of temperature-controlled pistons which

"Development of Heavy-Duty Engine Oils for Military Vehicles"

CAPT. W. B. BASSETT, Ordnance Department, U. S. Army

"The Effect of Piston Design on Piston-Ring Sticking"

H. F. BRYAN, International Harvester Co.

"Diesel Engine Operating Experiences on the Alcan Highway"

CAPT. J. L. CASSELL, Office of the Chief of Engineers, U. S. Army

"Adequate Piston Cooling"

GREGORY FLYNN, JR., General Motors Corp.

"Outlook for Post-War Diesel Fuels"

A. L. FOSTER, Petroleum Publishing Co.

"Engine Performance with Low Cetane Number Fuels"

L. W. GRIFFITH, Shell Oil Co., Inc.

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were a product of the study of and which have been built for further experimental work in a CFR engine. Petroleum technologists saw in the improved design and jet cooling an appreciable lowering of peak oil temperatures, and a resulting relief of the excessive task imposed upon the lubricant engine output.

Pistons are temperamental things, recent researches by engine designers and petroleum technologists showed.

Prima donna characteristics show up in tests when, for example, careful analysis of data shows that only a 5F variation in piston temperature occurs from cycle to cycle, yet during a 9 hr run under constant load and speed, the piston temperatures of an engine will vary as much as 5 to 30F from the record of the previous day, and they are neither uniform nor do they run in the same direction. This sensitivity to slight changes of running conditions, ring seating, wear, varying degrees of blowby, and hours of work of an engine part provoked stimulating discussion in the meeting and in the corridors of the hotel as engineers and petroleum technologists swapped test data on the idiosyncrasies of inanimate pistons.

Again sights of engine designers and petroleum technologists were raised to new horizons when the theory of heat transfer from the hot combustion gases to the piston was developed in detail.

A series of equations to enable easier valuation of experimental results of heat transfer in internal combustion pistons was offered to determine:

1. How heat flows from the combustion gases to the piston crown;
2. Its path through the crown to various points of dissipation, and
3. How the heat is removed.

In bold strokes the problem of ring sticking was attacked from the standpoint of piston design, and the solution of the ring-sticking problem may well result from this development.

Assuming that definite control of heat flow to the rings is necessary in diesel iron pistons, agreement was reached that this can be best obtained by limiting the area of the cross section immediately above the top ring, or back of all rings.

It was said that, at best, rings are only 65% as effective as the ring lands and skirt for transferring heat from the piston to the cylinder walls. The larger the ring clearance the less effective in this respect the rings become, engineers were reminded.

Wider fuels and lubricants horizons are being scanned, the meeting indicated, from the new vantage points erected by military-industry cooperation since the war started.

It is clear, however, that these new points have been built on the cooperative work among industry technicians over several past decades. Whether in development of successful multi-purpose fuels and lubricants for the military, or in improvement of oil filter designs, pooling of knowledge has proved vital to progress.

Although current attacks on some fuels and lubricants problems are closely guarded military secrets, the pattern of the cooperatively developed projects became clear as the meeting went on.

One Army officer said confidently that the new Army fuels and lubricants specifications are important right now, and that the oils they describe can be depended upon in future combat operations – under all conditions.

Cited as an example was successful field experience with heavy-duty oils meeting

Co-author "Diesel Engine Operating Experiences on the Alcan Highway"

LT.-COL. E. F. NORELIUS, Ordnance Department, U. S. Army

"Filtration Of Diesel Fuel and Lubricating Oils"

LT. H. V. NUTT, USNR, U. S. Naval Engineering Experiment Station

"An Analysis of the Heat Flow into Pistons"

CARL H. PAUL, Caterpillar Tractor Co.

Co-author "Adequate Piston Cooling"

A. F. UNDERWOOD, General Motors Corp.

"Some Problems Connected with Supercharging Diesel Engines"

E. W. WASIELEWSKI, McCulloch Engineering Corp.

Co-author "Engine Performance with Low Cetane Number Fuels"

R. C. WILLIAMS, Caterpillar Tractor Co.

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Fuels and Lubricants Activity Committee Meets

Vice-President J. R. Sabina and his Fuels and Lubricants Engineering Activity Committee met during the National SAE Diesel-Fuels and Lubricants Meeting May 17 and 18 in Chicago to plan future sessions of the activity at future meetings. Standing, left to right are: Lt. A. D. Brabbs (guest), Navy Experiment Station; A. J. Blackwood (representing R. E. Ellis), Standard Oil Development Co.; W. B. Ross, Pure Oil Co.; Capt. W. B. Bassett (guest), Ordnance Department, U. S. Army; C. M. Larson, Sinclair Refining Co.; Charles W. Butler (guest), Gulf Research & Development Co.; W. F. Aug, Mack Mfg. Corp.; T. A. Bissell, SAE Staff Representative; A. Ludlow Clayden, Sun Oil Co.; B. E. Sibley, Continental Oil Co.; J. M. Campbell, General Motors Corp.

Seated, left to right, are: C. B. Veal, Coordinating Research Council, Inc.; A. W. Pope, Jr., Waukesha Motor Co.; Warren G. Brown (guest), Caterpillar Tractor Co.; W. F. Joachim, U. S. Naval Engineering Experiment Station; W. G. Ainsley, meetings chairman, Sinclair Refining Co.; J. R. Sabina, vice-president and chairman, E. I. du Pont de Nemours & Co.; A. G. Marshall, Shell Oil Co.; Earl Bartholomew, Ethyl Corp.; J. M. Crawford (guest), Chevrolet Division, General Motors Corp., and C. C. Moore, Union Oil Co. of Calif.

Army specification 2-104B, the single specification providing engine oil for use with all Ordnance vehicles – whether powered by gasoline or diesel engines – and for the three grades of oil on which Ordnance has standardized for all types of operation: SAE 10, 30, and 50. Oil of this type has performed satisfactorily under extreme conditions in both desert and arctic areas. General engine cleanliness, freedom from corrosion and freedom from ring sticking in engines in which it has been used, were consistently reported. Thus increased engine life and longer periods between overhauls have been attained – to the gratification of many men who had contributed much to the backgrounds of lubrication specifications.

Among the beclouded subjects in automotive engineering and lubricants is the subject of filter. Enlightenment came to both engine engineers and lubricating experts in a clear-cut engineering approach to the problem in one report on extensive tests made by the Navy of all sizes and types of filters on the market.

An exposition of detail design in this equipment from the Navy's experience, and the result of a standardization program which reduced from 40-odd to four the types of oil filters and fuels filter units now in use, was heard by men long plagued by the question of lubricant filtration.

Because of the detergents used in modern lubricants, removal of carbonaceous materials was said to be impractical with commercial filters because in removing the carbonaceous particles the filter also removes these additives. Furthermore, one speaker defined abrasive materials in lubricating oil as consisting of particles with their largest diameters of 0.0002 in., or 5 microns, and greater. Lowest possible concentration of this abrasive material can be maintained by circulating the lubricating oil through the filter element at the highest possible rate, several experts agreed.

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The horizon of future diesel-engine design is overcast with questions about post-war fuels.

During the meeting a number of well-positioned authorities thought to clear the vista and give design engineers a better view of what to expect in fuels. Navy, Army, and civilian engineering experiences were merged in an attempt to clarify the thinking about post-war fuels.

However, at sessions where either engine designers predominated or where petroleum technologists were in force, there was clear agreement that specifications of post-war fuels must be compromised between optimum performance and the economics of a barrel of crude. The most efficient fuel might well mean a large loss of the base stock. Thus the work on engine improvements reported throughout the meeting assumed even greater importance in view of the general belief that the diesel fuel of the post-war period cannot economically be "tailored" to existing engines.

Several petroleum technologists and engine engineers agreed that fuels would be of lower ignition quality after the war. However, others supported the view that additives would be developed to accomplish improved engine performance.

Specifically, there was agreement among petroleum technologists that the post-war diesel fuel cetane requirement should be held between 40 and 45, and engine designers were warned that current refining is being carried on under abnormal conditions and at economic sacrifices which cannot be expected to be continued following the war.

On the other hand, engine designers have been hoping that a result of wartime research, pooling of development information,

Alan E. Ashcraft (standing, center) who introduced Capt. Small at the dinner, Harold G. Smith (left) toastmaster, and Grover C. Wilson, a member of the General Committee, with Walter G. Ainsley and W. H. Oldacre (both seated), also members of the General Committee of the SAE National Diesel-Fuels and Lubricants Meeting, Chicago

and refining experiences in this period of accelerated production would disclose fuels which might permit of better specific output in the diesel powerplants of tomorrow.

Thinking Is Coordinated

Throughout the two-day meeting petroleum technologists and diesel engine engineers agreed repeatedly that the sessions epitomized the only possible direct approach to diesel engine improvement, namely, the closest possible coordination of engineering thinking and actual development work between the refiners and engine designers.

The long experience of the SAE in cooperative development of standards and specifications was often referred to as the hope was expressed again and again that such meetings as these would continue to keep engineers and refining technogolists abreast of new experiments and experiences to maintain the United States in a dominant position in respect to diesel powerplants.

Discussions following the meeting were continued by groups in the hotel corridors and dining rooms, where the interchange of ideas went on and new acquaintances were formed. Observers saw clearly that an aftermath of the meeting would be further interchange of information in the interest of better performing engines.

Planning Praised

Much of the success of the meeting, many engineers agreed, stemmed from the careful planning of topics for the papers and the choice of their respective authors and discussers.

Chairman E. R. Barnard of the SAE Chicago Section and his colleagues on the Governing Board came in for praise for their assistance in arranging the details of the meeting, which registered a total attendance of nearly 750, representing every industrial and petroleum center of the country from coast to coast, and from Canada to the Gulf.

Despite necessary military censorship of a number of engineering subjects, this meeting again demonstrated the worth of interchange of ideas, and proved that men hard at work on sundry projects for the Army and Navy find stimulation in gathering for serious consideration of new engineering developments.

Barnard Honored

The Chicago Section presented a desk set to E. R. Barnard, its outgoing chairman, in a simple ceremony immediately preceding the start of the dinner program on Wednesday evening. Introduced by Toastmaster Harold G. Smith, James T. Greenlee made the presentation in behalf of the Section, expressing the Section's deep appreciation for the outstanding leadership given by Mr. Barnard during his term of office. Mr. Greenlee is Chicago Section chairman for the 1944-45 Section year.

■

All papers presented at this SAE National Diesel-Fuels and Lubricants Meeting will appear in a later issue of the SAE Journal either in full in the Transactions Section or as digests

TRANSPORTATION & MAINTENANCE MEETING

Bellevue-Stratford Hotel Philadelphia

JUNE 28-29

WEDNESDAY, JUNE 28

MORNING

Trucks as of 19—
—B. B. Bachman, Autocar Co.

AFTERNOON

Hot Engine Sludge and Its Control
—H. C. Mougey, Research Laboratories Division, General Motors Corp.

Cold Engine Sludge and Its Control
—B. E. Sibley, Continental Oil Co.

Filters and the Sludge Problem
—E. G. Gunn, Fram Corp.

EVENING

DINNER

Franklin C. Burk
Chairman, SAE Philadelphia Section

H. H. Kelly, Toastmaster

William S. James, President, SAE

COL. J. M. JOHNSON
Director, Office of Defense Transportation, Washington, D. C.

★

THURSDAY, JUNE 29

MORNING

Factors of Design and Construction Affecting Cooling System Maintenance
—Daniel H. Green, Cooling System Products Division, National Carbon Co., Inc.

AFTERNOON

What Truck and Bus Operators Should Know about Synthetic Tires
—J. E. Hale, Firestone Tire & Rubber Co.

Employment of Electronics for Effecting Tire Vulcanization
—Lt.-Col. C. W. Vogt, chief, Technical Staff for Supply, Transportation Corps

★

ERVIN N. HATCH
Chairman
T&M Activity
Meetings Committee

About SAE

Cleemann Withers Named to Executive Post

CLEEMANN WITHERS, formerly vice-president of Gray Mfg. Co., Hartford, Conn., is now connected with Ranger Aircraft Engines, Division of Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y., as a member of the general manager's executive staff.

JOHN C. MENGE is now in the U. S. Navy, and is stationed at the Navy Pier, Chicago. He had been senior tool expediter for Thompson Products, Inc., Cleveland.

ROY S. SANFORD, consulting engineer and vice-president of Autoyre Co., Oakville, Conn., a pioneer in the development of four-wheel braking systems, severed his consulting connection with Bendix-Westinghouse Automotive Air Brake Co., as of May 1. He first became associated with Bendix interests in 1925, and worked on aircraft brake developments with the late Eddie Stinson more than 15 years ago. He continues his association with Baird Machine Co., Bridgeport, as consulting engineer.

ROLAND S. ELY, formerly engineering laboratory supervisor for AiResearch Mfg. Co., Inglewood, Calif., is now at the U. S. Naval Academy, Annapolis, Md.

ELMER L. BROWN has been transferred from the Ordnance Department, Camp Holabird, Baltimore, Md., to the Office of the Inspector General, Washington, D. C.

ANTHONY V. DI NUCCI is now a lieutenant commander, USNR, and is stationed at Portsmouth Navy Yard, Portsmouth, N. H.

COL. F. W. HUNTINGTON has been transferred from the Replacement Training Center, New Orleans Army Air Base, to the Army Service Forces Training Center, Camp Plauche, same city.

LT. CHARLES B. WONDERS may now be reached at A.P.O. 5253, c/o Postmaster, New York City. He was formerly at Camp Ellis, Ill.

RALPH E. FLANDERS, who had been president of Jones & Lamson Machine Co., Springfield, Vt., is now president of the Federal Reserve Bank of Boston. Due to these duties he has resigned as chairman of the Machine Tool Committee, Combined Production & Resources Board of the United States, Great Britain, and Canada.

EUGENE W. WASIELEWSKI has been appointed chief engineer of McCulloch Engineering Corp., Milwaukee. Formerly project engineer for Ranger Aircraft Engines, he was later assigned to Stratos Corp., another division of Fairchild Engine & Airplane Corp. He is a member of Committee E-14, Automatic Power Controls, of the SAE Aircraft Engine Subdivision.

Eugene W. Wasielewski

T. P. WRIGHT, former SAE councilor and director of the Aircraft Resources Control Office, WPB, who had been conferring in London on aircraft design and technical problems as head of the American Service Mission, recently returned to the United States. The Mission, composed of officers of the AAF and the Navy Bureau of Aeronautics, included: Rear-Admiral E. M. Pace; Brig.-Gen. Grandison Gardner; Brig.-Gen. B. W. Chidlaw; Capt. H. R. Oster, USN; Capt. L. C. Stevens, USN; Col. R. C. Wilson and Com. J. S. Russell, USN.

FRED H. FIELDING, Washington branch manager and Government representative for the Heil Co. for the past 12 years, has recently resigned this position to become associated with the James A. Allan Co., mechanical and industrial engineers, organized by **JAMES A. ALLAN,** chairman of the SAE Washington Section.

CAPT. PAUL L. HAINES may now be reached at A. P. O. 887, c/o Postmaster, New York City. He was formerly with the U. S. Army Ordnance Department in Detroit.

RALPH H. KRESS is now a major in the U. S. Army, and may be reached at the Highway Division, Office of Chief of Transportation, Washington.

HARRY T. PRIEST, previously instructor at the University of Minnesota, Minneapolis, is now manager for P. K. Priest, Inc., Duluth, Minn.

CAPT. ANDERSON G. BARTLETT has been transferred from the Office of the Quartermaster General, War Department, Washington, and may now be reached at A. P. O. 113, New York City.

LT.-COL. LEE M. CORLESS has been transferred from Camp Maxey, Tex., to A. P. O. 5185, c/o Postmaster, New York City.

D. C. WHITE, who had been principal automotive specialist at the Lordstown Ordnance Depot, Warren, Ohio, is now at the St. Louis Ordnance Depot in the same capacity.

Previously production manager for Strip Bearing Division, Federal Mogul Corp., Greenville, Mich., **NORMAN L. JOHNSON** is now connected with Witte Engine Works, Kansas City, Mo., in a similar capacity.

EVERETT E. HART is now aeronautical engineer and test pilot for the Engineering & Research Corp., Riverdale, Md. He was formerly flight instructor at Parks Air College, East St. Louis, Ill.

JAMES H. MARKS, an official of Packard Motor Car Co. for 28 years, has been named an executive vice-president of the company. He has handled Packard's contractual relations with the Government on war production, and recently was appointed chairman of the contract termination committee of the Automotive Council for War Production.

James H. Marks

Members

WILLIAM N. DAVIDSON, JR., who had been aeronautical standards engineer for Eastern Aircraft Division, General Motors Corp., Linden, N. J., is now with Boots Aircraft Nut Corp., New Canaan, Conn., as field engineer.

GEORGE STERN, formerly production supervisor of Greer Hydraulics, Inc., New York City, is now with the Empire Electric Brake Co., Newark, N. J., as production manager.

JACK OLEN BENNETT, who had been research project engineer and pilot for Eastern Air Lines Transport Corp., Chicago, is now pilot and aeronautical engineer for American Export Airlines, Inc., La Guardia Field, N. Y.

RALPH Y. KONO, who had been an electrical and carburetor specialist for Rasmussen & Thompson Co., Ogden, Utah, now has the same position for Wasatch Motor, same city.

H. E. ROMBERG, formerly chief body designer, Diamond-T Motor Car Co., Chicago, is now employed as an ordnance engineer for the Government at the Massey-Harris Tank Plant, Racine, Wis.

MAJOR GEORGE H. SCHOENBAUM, U. S. Army, Office of the Quartermaster General, Fuels & Lubricants Division, has been transferred from Washington to the West Coast Petroleum Sub-Office, Oakland, Calif.

CARLETON E. STRYKER, formerly chief of the Conservation & Standards Division, Aircraft Production Board, Resources Control Office, Washington, is now Pacific Coast representative of the landing gear department, Bendix Products Division, Bendix Aviation Corp., Los Angeles.

Carleton E. Stryker

Elected Fellow of Royal Aeronautical Society

Courtesy L. Victor

DR. STEPHEN J. ZAND, director of the Vose Memorial high-altitude laboratory of Sperry Gyroscope Co., Inc., Great Neck, L. I., and a former vice-president of the SAE, has been elected a fellow of the Royal Aeronautical Society. He is the thirteenth American to be so honored by the Society, which was founded in 1866. In his spare time, Dr. Zand makes model airplanes for his eight-year-old son, and above he is shown during one of his moments of relaxation.

Lt.-Col. L. D. Boyce

L. D. BOYCE is now a lieutenant colonel in the U. S. Army Ordnance Department, stationed at Aberdeen Proving Ground, Md. In civilian life he was an engineer for Carter Carburetor Corp., St. Louis, Mo.

EDWARD E. SPIER, JR., formerly stress analyst for Northrop Aircraft, Inc., Hawthorne, Calif., is now in the U. S. Navy, and may be reached at the Naval Training Station, Great Lakes, Ill.

D. G. SAMARAS, who had been a flight lieutenant in the RCAF, is now a squadron leader stationed overseas.

WILLIAM G. PEARCE, a former student at General Motors Institute, is now in the U. S. Army, stationed at Waco, Tex.

CHARLES J. MURPHY, previously an engineer for Lithium Co., Newark, N. J., is now in the U. S. Army, and may be reached at Fort Belvoir, Va.

H. L. FREEMAN, an automotive adviser for the Ordnance Department, has been transferred from the Pomona (Calif.) Ordnance Base to Camp Gordon, Ga.

ENSIGN J. S. KLEINBERG, USNR, is now at the Sub Chaser Training Center, Miami, Fla. He had been at the U. S. Naval Academy, Annapolis, Md.

Previously a student at the University of Maine, LOUIS J. SPAGNUOLO is now in the U. S. Army, stationed at Fort Jackson, S. C.

CAPT. JOHN B. DUCKWORTH, AAF, may be reached at Powerplants Laboratory, Wright Field, Dayton, Ohio. He was formerly research engineer for Standard Oil Co. of Ind., Whiting, Ind.

LT. (jg) ROBERT H. THORNER, USNR, has been transferred from the Naval Air Technical Training Center in Chicago to the Naval Air Experimental Station in Philadelphia, where he is test engineer.

CYRIL C. LAWTON, a lieutenant colonel in the U. S. Army, may now be reached at A. P. O. 515, c/o Postmaster, New York City. Col. Lawton was formerly stationed at Camp Lee, Va., where he was assistant director of motor training.

DOUGLAS E. AGREN is now an ensign in the U. S. Navy, Philadelphia Navy Yard. As a civilian he was an engineer for the Industrial Wire Cloth Products Corp., Wayne, Mich.

FLIGHT OFFICER JOSEPH G. ROSE, III, AAF, is stationed at Sedalia Army Air Base, Knobnoster, Mo. He was formerly an aviation cadet at Blackland Field, Waco, Tex.

WALTER R. WESTPHAL is now connected with Towmotor Corp., Cleveland, as chief engineer. He was formerly experimental engineer for International Harvester Co., Fort Wayne, Ind.

Previously a draftsman at Thompson Products, Inc., Cleveland, JOSEPH J. TAKACS is now in the U. S. Army, and may be reached at Fort Sill, Okla.

Formerly in the sales and engineering departments of New England Tape Co., Inc.,

Hudson, Mass., **GRANT C. EHRLICH** is now president of Resin Industries, Santa Barbara, Calif.

Formerly design draftsman for Eclipse Aviation Division, Bendix Aviation Corp., Bendix, N. J., **LEONARD S. WIENER** is now connected with York Research Corp., New York City, as chief mechanical engineer.

Leonard S. Wiener

FRANK ARLEN is now chief engineer for Kalamazoo Stamping & Die Co., Kalamazoo, Mich. He was formerly plant engineer for Kalamazoo Stone & Furnace Co., same city.

ENSIGN WILLIAM E. SCHAEFER has been transferred from the Philadelphia Navy Yard to Hunter's Point Branch, Mare Island Navy Yard, San Francisco.

EARL R. RANKIN, who had been head automotive adviser for the U. S. Army Ordnance Service Command Shop, Fort Ord, Calif., is now inspector of automotive and parts ordnance material at the Salvage Segregation Center, South Gate, Calif.

EVERETT L. CONSIDINE, a lieutenant in the U. S. Navy, is at the Submarine Chaser Training Center, Miami, Fla.

Formerly Army Air Forces inspector for the Materiel Division, Inspection Section, Titeflex, Inc., Newark, N. J., **HERBERT SCHARF** is now with Kellett Aircraft Corp., Upper Darby, Pa., in the same capacity.

WILFRED D. MERRIMAN, an engineer in the U. S. Army Air Forces, is now with Buick Motor Division, Melrose Park, Ill. He was formerly in the Civilian Personnel Section, Central Procurement District, Detroit.

LT.-COM. K. L. HERRMANN, USNR, has been transferred from the Bureau of Aeronautics in Washington to the office in Los Angeles. He is a past vice-president of the Society in charge of Production Engineering Activity.

FLOYD JAMES HARTSHORN, JR., is now a lieutenant (jg) in the U. S. Navy. In civilian life he was field engineer for Timken Roller Bearing Co., Milwaukee.

H. L. EBERTS, formerly factory manager for Small Electric Motors (Canada) Ltd., Leaside, Ont., is now connected with Stevenson & Kellogg, Montreal, Que. Mr. Eberts is a member of the T&M Engineering Activity Committee.

D. S. BRUCE, previously division chief, research laboratories of Johns-Manville Corp., Manville, N. J., is now associated with Gummed Products Co., Troy, Ohio.

HOWARD D. GOLDGRABER, formerly test engineer for General Electric Co., West Lynn, Mass., is now employed as a junior engineer for Kellex Corp., New York City.

WALTER G. CHANDLER, previously superintendent of transportation, Brooklyn Edison Co., Inc., Brooklyn, N. Y., is now with Consolidated Edison Co. of N. Y., as assistant general superintendent of the transportation department.

Walter G. Chandler

A. T. COLWELL, vice-president of Thompson Products, Inc., Cleveland, has been appointed chairman of a special committee of the Automotive Council for War Production on redistribution, removal and disposal of surplus war property. The committee's function will be to study these three problems and recommend to the board of directors the extent to which the Council should deal with them.

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NACA Meets in Washington to Discuss Aircraft Problems

At a regular meeting of the National Advisory Committee for Aeronautics in Washington recently, military leaders of the Army and Navy air organizations discussed with their civilian scientific colleagues on NACA possible means to improve the military effectiveness of combat airplanes. Shown at the meeting are, front two: WILLIAM LITTLEWOOD, American Airlines, Inc.; and DR. THEODORE P. WRIGHT, Aircraft Production Board, who, lately returned from England, reported the results of his observations of American airplanes in service in the European theater. Left to right are: Dr. William F. Durand, Stanford University; Major-Gen. Oliver P. Echols, AAF; Dr. Vannevar Bush, Office of Scientific Research & Development; Vice-Admiral John S. McCain, USN; Major-Gen. Barney M. Giles, AAF; DR. ORVILLE WRIGHT; DR. GEORGE W. LEWIS, NACA; DR. JEROME C. HUNSAKER, chairman, NACA; John F. Victory, secretary, NACA; Dr. Charles G. Abbot, Smithsonian Institution; EDWARD WARNER, Civil Aeronautics Board; Dr. L. J. Briggs, National Bureau of Standards; Rear-Admiral E. M. Pace, USN; W. A. M. BURDEN, assistant secretary of Commerce; Dr. F. W. Reichelderfer, chief, U. S. Weather Bureau.

HARD-SURFACING

Applications and Techniques

HARD-SURFACING, or hard-facing as it is generally called in the welding industry, is the process of welding a hard, wear-resistant alloy on to a metal wearing surface. The deposited alloy can be in the form of a coating, edge, or point, depending on the size and shape of the wearing surface. Because of the nature of the process, the methods, equipment, and training of operators are, for the most part, similar to those employed in good welding practice.

The advantages of hard-surfacing are derived from the greater resistance to wear afforded by the hard alloy surface. Greater resistance to wear means longer life of parts which, in turn, reduces the need for frequent replacements. Replacement requires labor and means that machines and equipment are tied up. Thus, hard-surfacing saves manpower and helps to keep valuable apparatus in operation.

Additional advantages come from using hard-surfacing in salvaging worn parts, for frequently worn parts can be salvaged at low cost, and made better than when they were new. Often, power is saved and, particularly, when engine valves are hard-faced, fuel is conserved. Top power is available for longer periods after replacement. Moreover, special valve steels, frequently made of critical materials, are made to serve the life of the engine.

■ Equipment Required

The oxyacetylene welding flame, the metallic arc, or a carbon arc can be used to apply the standard hard-facing rods. The electric processes are, at present, widely used for coating large areas where surface finish is of little or no importance. Hence, they are usually less suitable for automobile and truck parts than is the oxyacetylene process, in which the flame provides better control over the molten puddle and results in less loss of alloy.

■ Magnaflux Test

Before doing hard-facing work, it is desirable to determine if it is sound. This can be done by use of the magnaflux method of test. Frequently, it is also advisable to check the part after work to make sure that no defects have been introduced by the hard-facing process.

■ Oxyacetylene Process

The equipment required for hard-surfacing resolves itself into standard welding supplies, including sources of oxygen and acetylene, pressure regulators, hose, and a suitable welding blowpipe, all costing around $100.00 to $125.00. Also needed are safety auxiliaries, such as gloves, goggles, a sturdy, fireproof welding table, and a good water supply; hard-facing welding rod and, in special work, a flux; and optionally, but preferably if large numbers of similar parts are to be hard-faced, suitable jigs or fixtures. Facilities for preheating are also desirable if large parts are to be hard-surfaced or if the parts to be hard-surfaced are of carbon or alloy steels containing over 0.50% carbon. Preheating equipment can take the form of homemade, gas-fired, brick furnaces or complex, commercial heating furnaces equipped with precision temperature controls. For the slow cooling of hard-surfaced parts, a large box containing lime or powdered mica is often useful.

All this equipment is usually found in progressive oxyacetylene welding shops. The only supplies consumed in the process are gases and hard-facing alloy rod. While no problem is presented by the oxygen, acetylene, and heating

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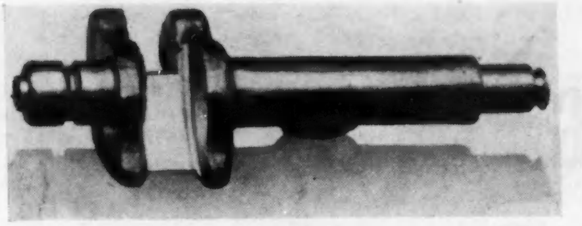
Report of Subcommittee, Maintenance Methods, Coordinating Committee, SAE Transportation and Maintenance Activity, Submitted to the Vehicle Maintenance Section, Division of Motor Transport, Office of Defense Transportation

SAE Maintenance Methods Coordinating Committee

W. J. Cumming, chairman, chief, Vehicle Maintenance Section, Division of Motor Transport, Office of Defense Transportation; E. P. Gohn, test engineer, The Atlantic Refining Co.; M. E. Nuttila, superintendent, Motor Vehicles, Cities Service Oil Co.; G. W. Laurie, manager, Automotive Transportation Department, The Atlantic Refining Co.; J. Y. Ray, supervisor, Automotive Equipment, Virginia Electric & Power Co.; S. B. Shaw, automotive engineer, Pacific Gas & Electric Co.; W. A. Taussig, automotive engineer, Burlington Transportation Co.; E. W. Templin, automotive engineer, Los Angeles Department of Water & Power; D. K. Wilson, superintendent, Automotive Equipment, N. Y. Power & Light Corp.; A. M. Wolf, automotive consultant.

Subcommittee on "Hard-Surfacing Applications and Techniques"

August Martin, chairman, shop superintendent, Pacific Freight Lines; F. C. Emery, engineering supervisor, Air Reduction Sales Co.; George Griffin, Jr., welding engineer, The Stoody Co.; E. V. Thurston, service engineer, Haynes-Stellite Co.; E. W. Templin, project chairman.



■ Fig. 1 – Hard-faced fuel pump cam rocker from a diesel engine

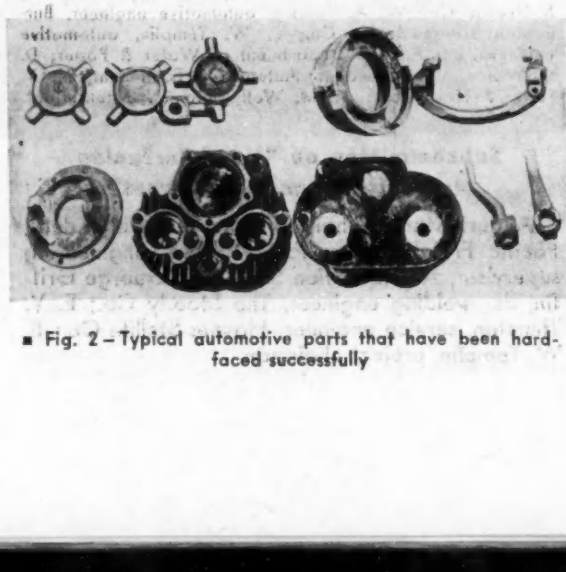
gases, the selection of hard-facing rod is important to assure long, serviceable life in the hard-surfaced part.

■ Electric Process

Heat is the medium used in both the electric and acetylene processes. If the article to be hard-surfaced is preheated so that the same amount of heat is present in the article during the hard-surfacing with either process, then there should be no difference in the final results. The heat in the electric process is much higher and covers about 1/10 the area covered by the acetylene process.

No preheating from the arc occurs when ordinary welding technique is employed. To preheat the steel, as in the acetylene process, the welder must hold a long arc, about ¼ in. in length. The machine setting should be 24 or higher on the voltmeter and the ampere setting should be high enough to turn the welding rod red its full length when welding. A circular motion should be used about ¾ to 1 in. in diameter. To start the circular motion, strike the arc in what will be the center of the cycle. Move slowly to the outer edge and continue the circle. The second and succeeding cycles should advance ¼ in. to the cycle. The idea is to keep deposited hard-facing metal fluid long enough to raise impurities and oxides on the surface of the steel to the surface of the molten hard metal and allow it to solidify in a smooth, solid deposit.

This postheating on each cycle is the only way it can be done correctly. If the welder advances more than ¼ in. to the cycle or moves too fast, slag from the coating on the rod drops on the colder surface of the steel and solidifies. The hard metal will flow around it and leave a slag hole. To raise this slag, the arc must be held over it until it melts and flows back on the hard metal. It is necessary to go back over the previously deposited, hard-surfacing metal and come back out over the edge of the molten, hard-surfacing metal onto the steel surface. If the speed of the cycle is too great, the same condition results. The speed of the cycle is determined by the melting of the steel surface. The fluid hard-surfacing will flow into the surface of the steel as fast as it reaches the melting point. If the machine setting is correct, the proper length of arc used, the cycle will require about 3 sec.



■ Fig. 2 – Typical automotive parts that have been hard-faced successfully

■ Selection of Hard-Surfacing Rod

Hard-surfacing rods fall into five major classes, and the composition of each of the classes is as follows:

Class I. Alloy cast irons and steels containing less than 20% alloying constituents.

Class II. Iron-base alloys containing over 20% alloying constituents (such as chromium, tungsten, molybdenum, manganese, and vanadium).

Class III. Nonferrous materials, such as cobalt-base alloys containing chromium and tungsten.

Class IV. Cast tungsten carbide which has been crushed and embedded in a high-strength steel binder.

Class V. Diamond substitutes consisting of small (usually ⅜ to 1½ in. long) cast "inserts" of tungsten carbide.

The welding-rod manufacturer should be consulted as to the proper rod to use and the proper method of application for the job in hand.

In terms of wear resistance with no accompanying impact or shock, the protection afforded by these classes of alloys ranges from Class I, with the least resistance, to Class V, with the greatest. This order is, in general, also that of their cost per pound (ranging from approximately 50¢ to $5.00). If the impact must be resisted, the order is reversed, alloys of Class I being tougher than those of Class V. For surfaces where smoothness or precision tolerances are not required, the choice of what alloy to use is determined by a balance of the factors of wear resistance, impact resistance, and cost. If, however, a smooth or precision surface is necessary, only those alloys of Classes I, II, and III can be considered. Since most automotive uses require a smooth hard-faced part, the most wear-resistant of the first three classes would normally be chosen.

■ Operator Training

Any experienced welder can, with a little practice, produce hard-faced parts that are excellent in terms of bond, freedom from impurities or blowholes, and surface smoothness. To apply the alloys of the Classes II and III, only a few variations of standard steel welding procedures are necessary. These are given only as an example of what modifications hard-facing may require.

On steel, Class II and III alloys are applied, whenever possible, *without penetration* into the base metal (this is very important). By so doing, it is possible to avoid dilution of the alloy with iron and thus to preserve unimpaired the abrasion-resisting qualities of the alloy. Such an operation is carried out with an oxyacetylene flame containing an excess of acetylene, adjusted so that the flare or outer cone of the flame extends two or three times the length of the inner cone. With this flame, a small area of the surface to be hard-faced is brought to a sweating temperature, and the end of the rod is brought into the flame, allowed to melt, and spread evenly over the sweating area. The rod is not stirred or puddled; instead, additional alloy is spread in the desired direction by means of the flame at a surface-sweating condition on the base metal.

Usually the coating can be built up to the required thickness in one operation, and this is most preferable.

The operator may need some special training or experi-

ence to do general hard-facing successfully. An illustration based on an experience will emphasize the point.

In a certain shop, there were four welders hard-facing the same kind of parts. These parts were finished by grinding to dimension. The thickness of the hard-facing was ¼ in. In checking these parts, they varied as much as ten points in hardness on the Rockwell C scale; the iron dilution ran as high as 20% (determined by analysis); the life's wear of the parts averaged 140 hr.

Using the same make of hard-facing rod but with proper welding (hard-facing) technique resulting in only 3 to 4% iron dilution, the parts showed only two points variation on the Rockwell C scale and the life's wear increased to 300 hr.

■ Costs of Hard-Surfacing

Deposits of hard-facing alloy generally range from 1/16 to ¼ in. in thickness. Parts, requiring a deposit thicker than ¼ in., are frequently rebuilt with steel or an alloy of Class I to within 1/16 to ¼ in. of finished size before hard-facing. The amount of alloy required for hard-facing any particular part can be estimated rapidly by reference to Table 1.

Table 1 – Approximate Weight of Alloy Per Sq In. of Surface

1/16 in. thick	0.02 lb	3/16 in. thick	0.06 lb
⅛ in. thick	0.04 lb	¼ in. thick	0.08 lb

■ Automotive Parts Regularly Hard-Faced

Representative automotive parts which are hard-faced by fleet owners, or by job-welding shops for them, are clutch parts, including release yokes, pressure plates, throw-out fingers, and release-bearing housings; tappets, valve stems and stem ends, and rocker arms; transmission-shifting fingers; and both water- and fuel-pump shafts. Diesel engines often have several valve and injector parts hard-faced in their manufacture. See Figs. 1 and 2.

Exhaust valves and exhaust-valve-seat inserts are hard-faced in large numbers by valve manufacturers for the engines of buses, trucks, and other commercial vehicles. There are 46 sizes of hard-faced replacement valves. The hard-facing of valves and valve-seat inserts is rarely done except by valve manufacturers because of the necessity for specialized technique and finishing equipment, and because of the need for such close heat control to maintain the necessary properties and condition of the steel from which valves and inserts are made. Figs. 3 and 4 show a valve being hard-faced in a well-equipped maintenance shop.

Among those parts readily hard-faced in fleet maintenance shops are the wearing surfaces of clutch mechanisms. Clutch-throwout yokes are hard-surfaced by the application of alloy 1/16 in. thick to the ends of the yoke fingers. The smooth surface of the alloy, with its low coefficient of friction, results in less wear on the clutch wheel surface.

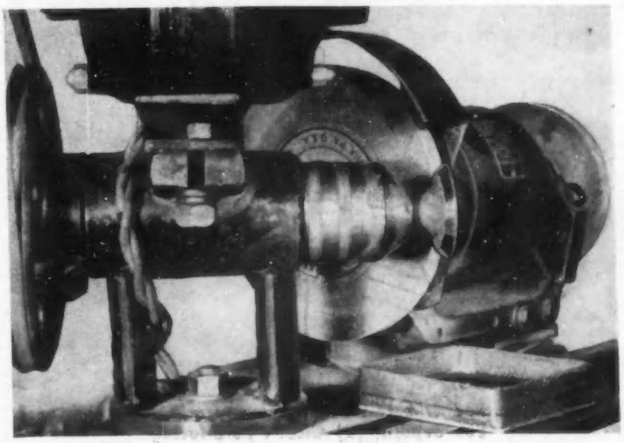
Clutch plates are hard-surfaced with suitable grades of Class II or III alloy rods at three spots each about ¾ in. in diameter, where the clutch-adjusting studs bear on the moving plate. Other wearing parts in the clutch are also hard-surfaced on just those areas which otherwise wear at such rate as to require frequent adjustment or replacement.

Valve tappets, stems and stem ends, as well as rocker arms, are frequently hard-surfaced to minimize wear.

■ Fig. 3 – Hard-facing on engine valve

These applications follow the general procedure and can be made by any experienced operator. It is suggested, however, that with valve-seating surfaces, the valves and inserts be purchased already hard-faced by the manufacturers of such equipment, if available, because of the equipment and experience necessary to produce a thoroughly satisfactory hard-faced product. However, shops with such equipment and expert personnel are turning out good and satisfactory work.

Water-pump shafts are faced over the bearing surfaces, particularly if the pump is packed. The application is most frequently made by the "skip" method, wherein longitudinal beads of a suitable grade of Class II or III alloy rod are supplied at first on one side of the shaft, then on the other, to minimize warpage caused by the heat of the welding flame. Shafts can sometimes be hard-faced successfully by the "spiral" method, wherein the bead is applied in the form of a helix. This can also be accomplished with little warpage from the heat of the flame. Not only do shafts, hard-faced by either of those methods, last up to four times as long as steel shafts, but the need for tightening or replacing the packing is minimized, because the smoothness and low coefficient of friction and freedom



■ Fig. 4 – Grinder for grinding hard-faced engine valves

from rust or corrosion of Class II and III alloys result in considerably reduced wear of the packing.

Trailer pintle hooks and eyes, tire chains, fifth-wheel pins, chain sprockets, brake camshafts, and so on, are also repaired by hard-facing.

■ Machine Parts in Maintenance Shops

Many parts of machines used for automotive maintenance are protected from wear by hard-surfacing. Typical of these are cams, lugs, and wearing surfaces of automatic machinery, lathe and grinder centers, boring-bar wear strips, hot-flash shaving tools, and dies of many types for hot-drawing, blanking, shearing, trimming, forming, and upsetting. Dies for hot-working are generally hard-faced with a suitable grade of Class III alloy rod.

With most other machine parts the hard-facing follows usual practice as outlined above. Additional recommendations, to assure best results with complex dies or other intricate parts which may require special care, can be obtained from the manufacturers of hard-facing alloys.

SPECIFIC INSTRUCTIONS FOR HARD-FACING APPLICATIONS

■ Tractor Drive Sprockets

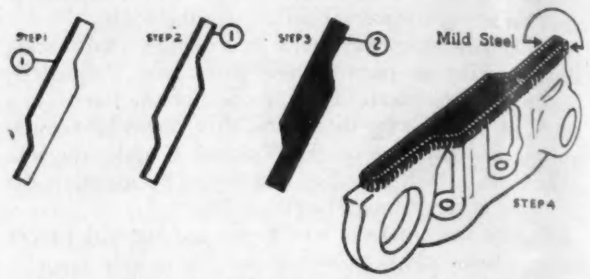
Tractor drive sprockets are not hard-faced when new, but are allowed to wear until play develops between sprocket teeth and track pad bushings. Sprockets are then rebuilt to original size and shape, using a suitable, Class I, hard-facing rod.

Material Requirements – (For two-drive sprockets from Rd 8 Caterpillar tractor) 25 to 30 lb, 3/16 in. diameter, coated, Class I, hard-facing rod (depending on extent of wear).

Hard-Facing Procedure – Leave sprockets on tractor, but block it up so the sprocket wheel can be turned during the welding operation. Fill in worn areas with 3/16 in. diameter, coated, Class I rod, using template made from new sprocket wheel to obtain proper shape. Bead should be applied transversely and the deposit of each rod peened while still hot. See Fig. 5.

Note: In cases of extreme wear, it is sometimes necessary to rebuild with high carbon before applying hard-facing alloy.

Result – The application of Class I, hard-facing rod extends the life of a sprocket wheel two to three times over those not protected. Because the hard metal deposit has a low coefficient of friction, hard-facing also reduces wear on track pad bushings, which are both expensive and difficult to replace.



■ Fig. 6 – Method of hard-facing tractor track rails: (1) high carbon deposit; (2) Class I hard-facing

■ Tractor Track Rails

The hard-facing of tractor track rails is limited to those which can be rebuilt by the application of one layer of metal.

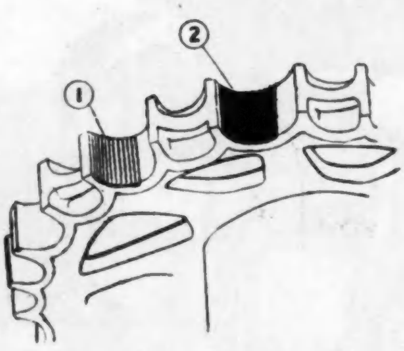
Material Requirements – (For rails from Rd 8 Caterpillar tractor) 20 lb, 3/16 in. diameter, high carbon, welding rod; 40 lb, 3/16 in. diameter, coated, Class I, hard-facing rod; 15 lb, 3/16 in. diameter, coated, mild steel electrodes.

Rebuilding and Hard-Facing Procedure – Lay track out on floor. Apply guide bead of high carbon rod to one side of 12 rails as shown in step 1, Fig. 6. Return and apply bead to opposite sides of 12 rails (See step 2, Fig. 6). Apply weaving bead of 3/16 in. diameter, coated, Class I, hard-facing rod between guide beads (See step 3, Fig. 6). Peen deposit of each rod of coated, Class I rod while still hot. Apply "tie in" bead of coated, mild steel to sides of rails as in step 4, Fig. 6. Check rail ends for proper clearance, removing excess metal with cutting torch.

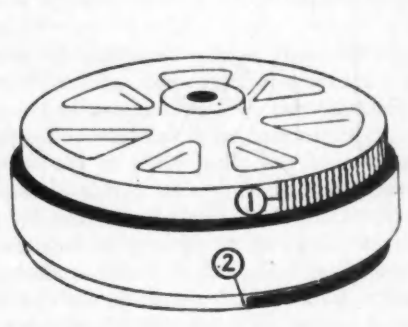
Results – Worn tractor rails, reconditioned as explained above, outlast new rails 25 to 50%. The hard-facing application can be repeated when necessary.

■ Tractor Idler Wheels

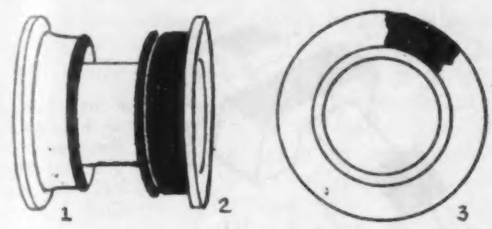
Tractor idler wheels are usually allowed to wear until they no longer operate efficiently. They are then repaired



■ Fig. 5 – Method of hard-facing tractor sprocket: (1) high carbon deposit; (2) Class I hard-facing



■ Fig. 7 – Method of hard-facing tractor idler wheels: (1) high carbon deposit; (2) Class I hard-facing



■ Fig. 8 – Hard-facing Caterpillar tractor roller

by the application of high carbon, steel electrodes and given a final overlay of suitable, Class I, hard-facing rod. This is another operation that can be repeated many times before the part is finally scrapped.

Material Requirements – (For two idlers from Rd 8 Caterpillar tractor) 50 lb, 3/16 in. diameter, high carbon electrodes; 30 lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

Rebuilding and Hard-Facing Procedure – Idler wheels are often left on the tractor during the rebuilding operation, but if desired, they can be removed and mounted into a fixture. In either event, low spots on guides and shoulders are filled in with high carbon, steel electrodes and a final overlay of coated, Class I, hard-facing rod, applied to retard future wear. See Fig. 7.

Result – A worn idler, hard-faced with Class I, hard-facing rod, will outlast two new idlers. Amount of material required for the application is approximately 15% of the weight of the idler.

■ Tractor Track Rollers

The hard-facing of tractor track rollers is strictly a rebuilding operation. Any type of steel roller can be rebuilt with satisfactory results. The hard-facing of cast-iron rollers is not recommended.

Material Requirements – (Per roller from Rd 8 Caterpillar tractor) 6 to 8 lb, 3/16 in. diameter, coated, Class I, hard-facing rod (depending on extent of wear).

Hard-Facing Procedure – Construct jig so that rollers can be turned during the welding operation. Clean area to be rebuilt on buffer or grinding wheel. If roller is single-flange type, apply guide bead to outer edge as in sketch 1, Fig. 8. Apply one or two layers of suitable, Class I, hard-facing rod between guide bead and flange as in sketch 2, Fig. 8. Apply weaving bead to flange as in sketch 3, Fig. 8. For best results, deposit of each rod should be peened while still hot. If desired, hard metal deposits may be rough-ground, but grinding is not absolutely necessary.

Result – Hard-faced rollers will outlast the best type of new roller obtainable on an average of 200%. The hard-facing operation can be repeated as often as necessary. Rollers on a large tractor weigh more than 1000 lb. To reclaim these rollers by hard-facing requires a maximum of 96 lb of rods.

■ Tractor Grousers

To minimize wear on tractor grousers, top of cleats should be hard-faced with suitable ¼ in. diameter, coated, Class I, hard-facing rod before the tractor is put into service. When this deposit wears away, the grouser should immediately be rehard-faced. Worn grousers may also be hard-faced, but cleats should first be rebuilt to original size by welding on a steel bar of the proper size and length.

Material Requirements for Rebuilding and Hard-Facing – (Per grouser)

Worn grousers:

Mild steel bar stock, ¾ x 1 in.; 1 lb, 3/16 in., coated, mild steel electrodes; ½ lb, ¼ in. diameter, coated, Class I, hard-facing rod.

New grousers:

½ lb, ¼ in. diameter, coated, Class I, hard-facing rod.

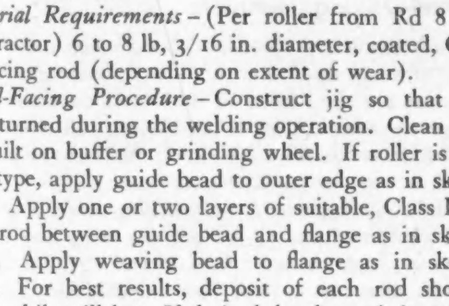
Procedure for Reclaiming Worn Grousers – Rebuild worn cleat to original height by cutting ¾ x 1 in. bar stock to proper length and welding on with coated, mild steel electrodes. Top of cleat should then be hard-faced with coated, Class I, hard-facing rod to prevent future wear. See Fig. 9.

Procedure for Hard-Facing New Grousers – New grousers are hard-faced as illustrated in sketch 1, Fig. 10, using ¼ in. diameter, coated, Class I, hard-facing rod. Danger of breaking grousers under severe operating conditions is minimized by allowing 1½-in. spaces between deposits as shown in sketch 2, Fig. 10.

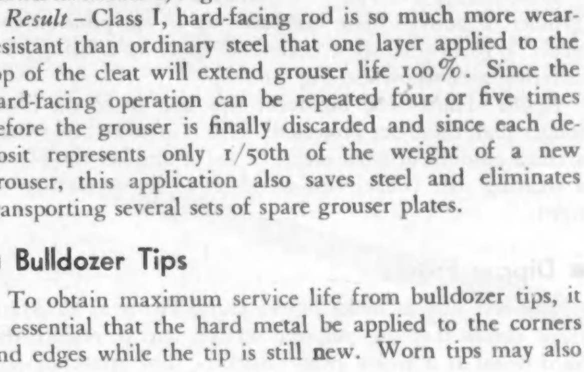
Result – Class I, hard-facing rod is so much more wear-resistant than ordinary steel that one layer applied to the top of the cleat will extend grouser life 100%. Since the hard-facing operation can be repeated four or five times before the grouser is finally discarded and since each deposit represents only 1/50th of the weight of a new grouser, this application also saves steel and eliminates transporting several sets of spare grouser plates.

■ Bulldozer Tips

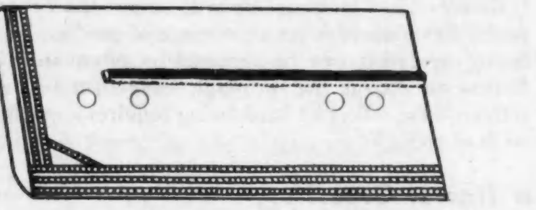
To obtain maximum service life from bulldozer tips, it is essential that the hard metal be applied to the corners and edges while the tip is still new. Worn tips may also



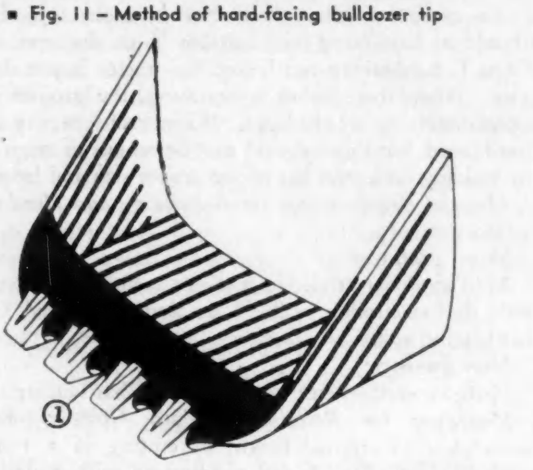
■ Fig. 9 – Placement of bar stock for welding on worn grouser cleat



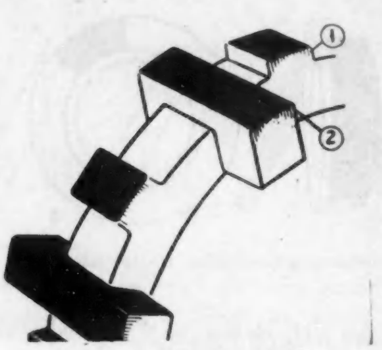
■ Fig. 10 – Method of hard-facing new grouser cleats: (A) coated Class I rod deposit



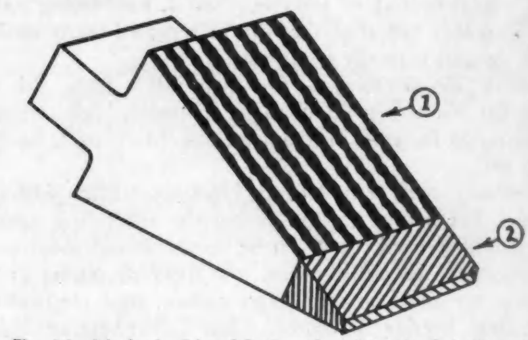
■ Fig. 11 – Method of hard-facing bulldozer tip



■ Fig. 12 – Hard-faced dipper front: (1) Class I hard-facing



■ Fig. 13 – Method of hard-facing shovel-driving tumbler: (1) high carbon deposit; (2) Class I hard-facing



■ Fig. 14 – Method of hard-facing shovel tooth: (1) Class I hard-facing rod; (2) Class IV hard-facing rod (four sides)

be hard-faced, but it is necessary that new corners made from scrap-grader blade steel be welded onto the bulldozer end with coated mild steel electrodes before the hard metal is applied.

Material Requirements – (For one bulldozer tip) 2 lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

Hard-Facing Procedure – Clean area exposed to wear on grinder or buffer. Place bulldozer tip in flat position and apply 3/16 in. diameter, coated, Class I, hard-facing rod, covering areas shown in Fig. 11.

Result – Hard-faced bulldozer tips last up to six times longer than those not protected. This is another case where a small amount of hard metal (2 lb) multiplies the life of a wearing part (dozer tips weigh 25-40 lb, depending on size).

■ Dipper Fronts

The best way to make dipper fronts last is to hard-face them before they are put into service, and to replace the hard metal as it wears away. Buckets, thus protected, last months and even years. Worn buckets may also be hard-faced, but it is first necessary to replace worn-away metal. This may be done by welding in sections of old grader blades, scrap manganese blades, or by the addition of nickel-manganese rod deposits. Whatever the method, an overlay of coated, Class I, hard-facing rod should be applied after the bucket has been rebuilt to retard future wear.

Material Requirements – (For new 2½-yd dipper front) 50 lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

Hard-Facing Procedure – Hard-face front of lip solidly with single layer of coated, Class I, hard-facing rod. Use the skip-and-jump method of welding to avoid overheating the manganese casting. Apply stringer beads of coated, Class I, hard-facing rod back of the solid deposit, spacing the beads at intervals of approximately 1 in. Hard-face sides and bottom of lip in same manner. For best results, each rod should be peened while still hot. See Fig. 12.

Result – Hard-facing provides the best means of keeping bucket lips in good repair. Because the hard-facing operation can be repeated many times, replacement lips are unnecessary.

■ Shovel-Driving Tumblers

Driving tumblers are not hard-faced when new, but are allowed to wear until they no longer operate efficiently. Worn areas are then filled in with steel electrodes and a final layer of coated, Class I, hard-facing rod is applied to reduce future wear. The rebuilding and hard-facing operation can be repeated as often as necessary.

Material Requirements for Rebuilding and Hard-Facing – (Two tumblers from 2½-yd shovel) 60 to 100 lb, 3/16 in. diameter, high carbon rods (depending on wear); 50 lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

Procedure for Rebuilding and Hard-Facing – Leave tumbler assembled, blocking it up so it can be turned during the welding operation. Rebuild to original shape and within ⅛ in. of size with 3/16 in. diameter, high carbon electrodes. Finish with final layer of coated, Class I, hard-facing rod. Use template made from new tumbler to obtain proper dimensions. See Fig. 13.

Result – Driving tumblers, rebuilt and hard-faced as explained above, outlast the best new tumblers obtainable, 200% or more. The weight of weld metal and hard-facing rods required for the reconditioning operation represents but 15% of the weight of a new tumbler.

■ Shovel Teeth

The proper way to protect any type of shovel tooth against abrasion is to hard-face wearing surfaces before the

teeth are put into service. By replacing the hard metal deposits before they wear entirely away, abrasive materials are prevented from coming into contact with the parent metal. Worn teeth may be rebuilt either by the addition of weld metal, or by the use of steel bars, but the real economy results from hard-facing new teeth before they are placed in service, thus avoiding replacing worn-away metal.

Material Requirements – (Per tooth from 2½-yd bucket) 1 lb, 3/16 in. diameter, 20-30 mesh, Class IV, hard-facing rod; 1 lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

Procedure for Hard-Facing Shovel Teeth – Hard-face teeth on all four sides with Class IV, hard-facing rod. Deposit should extend 2 in. upward from point. Apply stringer beads with 3/16 in. diameter, coated, Class I, hard-facing rod to top sides of teeth. Spaces between stringer beads should not exceed ½ in. See Fig. 14.

Result – Hard-facing keeps shovel teeth sharp and extends their life two to five times over unprotected teeth, thus eliminating frequent changing of teeth and reducing spare-parts inventory.

■ Shovel Crawler Pads

Shovel pads are not hard-faced when new but are usually operated until considerable play develops between driving tumbler and pads. Worn surfaces are then rebuilt with ordinary electrodes and a final layer of hard-facing metal applied to retard future wear.

Material Requirements – (Per pad from 2½-yd shovel) 5 lb, 3/16 in. diameter, high carbon electrodes (may vary according to wear); 2½ lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

Rebuilding and Hard-Facing Procedure – Lay track out flat and rebuild pads to original shape and within ⅛ in. of size, using high carbon electrodes. Apply final layer of coated, Class I, hard-facing rod. Peen deposit of each rod while still hot. See Fig. 15.

Result – Worn pads, costing $40.00 each and weighing over 100 lb, can be rebuilt in 2-3 hr with only 6-8 lb of metal. Furthermore, pads reconditioned and hard-faced by this method outlast new pads 200%.

■ Carry-All Blades

Carry-all blades should be hard-faced while new. There are two or three types of metal that can be used for this purpose, but Class IV, hard-facing rod is superior to others because it is made of cast tungsten carbide (the hardest known metal) contained in steel tubes. Deposits of Class IV rod not only offer maximum resistance to wear, but also have the ability to cut hard earth formations.

Material Requirements – (For one 8-ft blade – two edges) 7 lb, 3/16 in. diameter, 20-30 mesh, Class IV, hard-facing rod.

Hard-Facing Procedure – Bolt blade to carry-all. Adjust machine for 150 to 175 amp straight polarity and apply Class IV, hard-facing rod, using a weaving motion. Deposit need not exceed 1½ in. in width. See Fig. 16.

Result – Carry-all blades, hard-faced with Class IV, hard-facing rod, outlast ordinary blades as much as six to one and maintain a sharp cutting edge as long as any of the hard metal remains. Weight of Class IV rod required for the application is roughly 3% of the weight of an 8-ft scraper blade.

■ Sheepsfoot Tampers

Any type of sheepsfoot tamper, whether it is removable or stationary, should be hard-faced before it is put into service. When the tamping area is reduced below regulation size, tamps should be rebuilt with high carbon electrodes and a second deposit of Class I, hard-facing rod, applied in the same manner as the first.

Material Requirements for Rebuilding and Hard-Facing – (Per tamp)

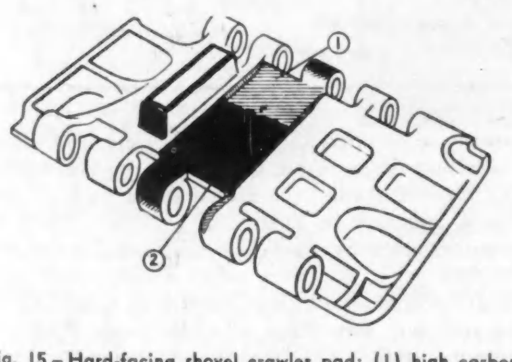
Worn tamps:

½ lb, 3/16 in. diameter, high carbon electrodes; 1/5 lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

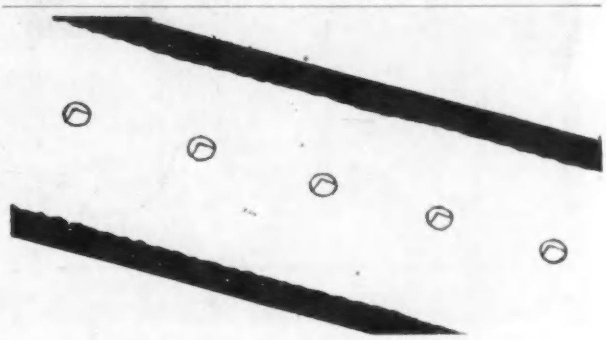
New tamps:

1/5 lb, 3/16 in. diameter, coated, Class I, hard-facing rod.

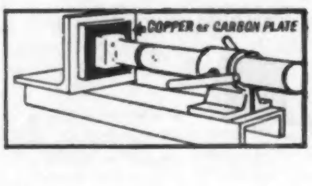
Procedure for Rebuilding Worn Sheepsfoot Tamps – If tamps are removable, build fixture so that tamps can be slipped into position and rebuild to size against a copper form. The rebuilding operation is done with high carbon electrodes. When the tamp is out of size, apply a single layer of 3/16 in. diameter, coated, Class I, hard-facing rod. If tamps are stationary, entire roller must be blocked up so it can be turned. See Fig. 17.



■ Fig. 15 – Hard-facing shovel crawler pad: (1) high carbon deposit; (2) Class I hard-facing deposit



■ Fig. 16 – Application of Class IV rod deposit to carry-all blade



■ Fig. 17 – Method of rebuilding worn sheepsfoot tamp

Procedure for Hard-Facing New Sheepsfoot Tamps – To hard-face new tamps, simply cover areas shown in Fig. 18, making sure that corners and edges of each tamp are well-covered. See Fig. 19.

Result – There are several cases on record where one application of Class I, hard-facing rod has prolonged tamp life 400%. Since the hard-facing application requires only 1/5 lb of hard metal and 5 min of welding time, savings in time and material over using ordinary tamps cannot be questioned.

■ Grader Blades

Most grader blades are made of high carbon steel and are heat-treated. If hard-faced in the heat-treated condition, they are likely to break if subjected to impact. For this reason, it is advisable to anneal blades, prior to hard-facing application.

Material Requirements – (Per foot of deposit, 2 in. wide) 6 oz, 3/16 in. diameter, 20-30 mesh, Class IV, hard-facing rod.

Hard-Facing Procedure – Bolt two blades back to back. If possible, blades should be annealed before hard-facing and kept hot while the Class IV rod is being applied. Machine should be adjusted for 150-175 amp straight polarity and Class IV rod deposited with a weaving motion. Deposit should not extend up from edge more than 2 in. When application is finished, allow to cool in still air. See Fig. 20.

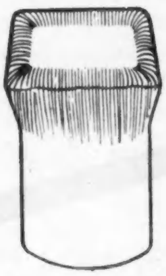
Result – Blades, hard-faced with Class IV, hard-facing rod, will retain a sharp cutting edge and outlast ordinary steel blades up to seven times.

Either a new or worn scarifier tooth may be hard-faced. All that is necessary is that the tooth be sharp and the top side of the point cleaned on a buffer or grinding wheel to remove oxides.

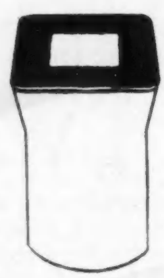
Material Requirements – (25 teeth, 1 in. wide) 1 lb, 3/16 in. diameter, 20-30 mesh, Class IV, hard-facing rod.

Hard-Facing Procedure – Prop teeth against brick so that the area to be hard-faced will be level. Deposit of Class IV rod need extend no more than 2 in. upward from the point. Deposit should not exceed more than ⅛ in. in thickness, and may be as thin as 1/16 in. Where heat-treatment is necessary, quench in oil. Avoid use of water. See Fig. 21.

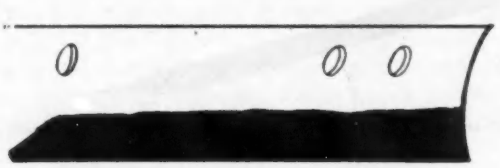
Result – Scarifier teeth, hard-faced with Class IV, hard-facing rod, will stay sharp 30 to 40 times longer than unprotected teeth. The hard-facing application can be repeated four or five times before the tooth becomes too short for further service.



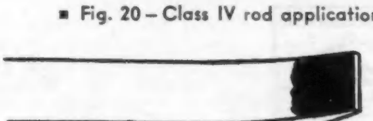
■ Fig. 18 (left) – Lines show area of new sheepsfoot tamp to be hard-surfaced



■ Fig. 19 (right) – Finished hard-facing of tamp



■ Fig. 20 – Class IV rod application to grader blade



■ Fig. 21 – Class IV rod deposit on scarifier tooth

SAE Coming Events

National Meetings

War Materiel, ***June 5-7, Book-Cadillac Hotel, Detroit***
T&M, ***June 28-29, Bellevue-Stratford Hotel, Philadelphia***
West Coast T&M, ***Aug. 24-25, Multnomah Hotel, Portland***
Tractor, ***Sept. 13-15, Schroeder Hotel, Milwaukee***
Aeronautic & Engineering Display, ***Oct. 5-7, Biltmore Hotel, Los Angeles***
Fuels & Lubricants, ***Nov. 9-10, Mayo Hotel, Tulsa***
Air Cargo, ***Dec. 4-6, Knickerbocker Hotel, Chicago***
Annual Meeting & Engineering Display, ***Jan. 8-12, 1945, Book-Cadillac Hotel, Detroit***
Aeronautic, ***April 4-6, 1945, Hotel New Yorker, New York***

Cleveland – June 2

Chagrin Valley Country Club; Annual Golf Outing.

Indiana – June 15

Antlers Hotel, Indianapolis; dinner 6:45 p.m. Low Cost Cylinder Design for Commercial Airplane Engines – J. P. Flannery, executive engineer, Aircooled Motors Corp.

Metropolitan – June 1

Pennsylvania Hotel, New York; meeting 7:45 p.m. Hardenability Testing – A. L. Boegehold, General Motors Research Div.

Milwaukee – June 16

Milwaukee Athletic Club; dinner 6:30 p.m. Annual Ladies night.

Muskegon Group – June 29

Occidental Hotel; meeting 7:30 p.m. Stress Analysis – W. T. Bean, Stress Laboratory, Continental Aviation & Engineering Corp.

New England – June 29

Weldon Hotel, Greenfield; dinner 6:30 p.m. New England Section Outing.

Peoria Group – June 19

Caterpillar Showroom; meeting 7:30 p.m. Gaseous Fuels – Dr. Richard Wiebe, Northern Regional Research Lab. Elevated Temperature Fatigue Tests of Aluminum Pistons – R. J. King, Caterpillar Research Lab. Heat Flow Into Pistons – C. H. Paul, research engineer, Caterpillar Tractor Co.

Southern California – June 2, 7 and 8

June 2 – Hollywood Roosevelt Hotel, Los Angeles; dinner 7:00 p.m. Annual Dinner Dance.

June 7 – Royal Palms Hotel, Los Angeles. Engine Cooling Fan Theory and Practice – Kenneth Campbell, senior project engineer, Wright Aeronautical Corp.

June 8 – U. S. Grant Hotel, San Diego. Engine Cooling Fan Theory and Practice – Kenneth Campbell, senior project engineer, Wright Aeronautical Corp.

Southern Ohio – June 5

Van Cleve Hotel, Dayton; dinner 6:30 p.m. Aircraft Remote Controls and Automatic Controls – R. M. Mock, vice president, chief engineer, Lear Avia, Inc.

News..
..OF THE SOCIETY

COOLING SYSTEM Report Goes to ARMY ORDNANCE

BASED upon the premise that the coolant level is the focal point of cooling system preventive maintenance, the SAE-Ordnance Vehicle Maintenance Committee has submitted a complete report on maintenance of cooling systems to the Army Ordnance Department. The work was done by the SAE-OVMC subcommittee on Cooling System Maintenance, and was compiled and edited to facilitate adaptation in existing Army publications.

The project was an example of close coordination of research work of industry, engineering reports of other SAE committees, and Army experience under the established practice of the SAE War Activity Council.

In view of the nontechnical background of the soldiers who will be asked to use this material, the whole report has been written in lay language and follows established Army nomenclature.

The study has been divided into:

Cooling System Construction, Function, and Operation;

1st Echelon Preventive Maintenance;

2nd Echelon Preventive Maintenance;

Organizational Maintenance Instructions;

Trouble Shooting, and

Ordnance Maintenance Instructions, which provide information which may be used in the cooling system section of the Army 1000-Series manuals. This is devoted to corrective cleaning.

The report is in considerable detail in order to present fully the background of the researches reported. The committee expects that wide use will be made of the report, not only by the Army but by other Government agencies operating large fleets and by commercial and for-hire fleet operators.

Members of the subcommittee which developed the report, serving with Chairman D. H. Green, National Carbon Co., Inc., were J. S. Ahrens, National Carbon service manager; Edward Chadwick, Little Falls Laundry Co.; H. L. Corkran and E. H. Keller, E. I. du Pont de Nemours & Co.; G. D. Ford and L. R. Gwyn, Jr., Railway Express Agency, Inc.; J. J. McCarron, Consolidated Telegraph & Electric Subway Co.; S. G. Page, Equitable Auto Co.; H. A. Reynolds, Harrison Radiator Division, General Motors Corp., and H. M. Smith, Connecticut Railway & Lighting Co.

The work was coordinated with other SAE committees by the SAE-Ordnance Vehicle Maintenance Committee, organized at the request of the Army Ordnance Department. Chairman of this group is D. K. Wilson, New York Power & Light Corp. F. K. Glynn, American Telephone & Telegraph Co.; Mr. Gwyn; J. Willard Lord, Atlantic Refining Co., and Austin M. Wolf, automotive consultant are members.

Changes Recommended By Shock Strut Group

REPRESENTATIVES of the Army, Navy and the Civil Aeronautics Administration met with the SAE Committee A-12, Aircraft Shock Struts, at the Van Cleve on April 20. The committee made several recommendations for changes and additional material for inclusion in ANC-2 (Army-Navy-Civil) Ground Loads Hand Book, and ANC-5, Strength of Aircraft Elements.

Excellent cooperation was received from the Army, Navy and CAA representatives and they appeared very pleased to receive coordinated comments from the industry. Arrangements were made for further cooperative work to be continued at the next meeting to be held in August.

Studying Parts Problem for Army

Pondering the fate of parts at overhaul is the Ordnance Vehicle Maintenance Committee on Limits and Tolerances for Replacement of Parts and Units, on May 3 in New York City. Left to right are G. O. Ford, Railway Express Agency, Inc.; D. K. Wilson, New York Light & Power Corp.; D. H. Green, National Carbon Co., Inc.; R. C. Penrod, Office Chief of Ordnance, Detroit; Chairman L. R. Gwyn, Jr., Railway Express Agency-Inc.; Irene Vecchione, SAE Staff; Major G. E. Fuller, Office Chief of Ordnance, Detroit; H. B. Truslow, Richmond Auto Parts Co., and H. B. Miller, Ohio Oil Co.

Absent were R. J. Cummins, Indiana Railroad Co.; O. C. Dunkin, Sterling Aluminum Products, St. Louis; Bryan Park, Central Greyhound Lines, Inc., Cleveland; W. G. Piwonka, Cleveland Transit System; Jean Y. Ray, Virginia Electric & Power Co.; W. A. Taussig, Burlington Transportation Co., Chicago, and Austin M. Wolf, consulting engineer, New York

CRC Statement

On operation and maintenance of civilian vehicles under wartime restrictions

At the request of the American Petroleum Institute and in the interest of conserving motorized equipment and fuels to the utmost, the Coordinating Research Council, of which the Society of Automotive Engineers and the American Petroleum Institute are sustaining members, has prepared the following recommendations.

The conscientious application on the part of the car owner of these carefully thought out measurers, with the advice and assistance of the Car Dealer and Service Station Operator, will extend the usefull life of the vehicle; provide maximum utilization of the limited fuel available; assure continued reliability of performance; and may postpone the necessity of an engine overhaul.

Driving

1. *Accelerate slowly:* Conservative driving reduces knock, saves fuel and makes the car last longer.

2. *Shift gears on hills:* For best economy keep in high gear as much as possible. If knock occurs use second gear which will permit hill climbing at reduced throttle.

3. *Don't race your engine or idle unnecessarily during the starting period:* This wastes fuel which could be used for transportation. The engine will warm up faster with the car in motion.

4. *Use choke properly—Manual type:* Return choke control to normal operating position as quickly as possible.

Automatic type: Consult the car dealer to insure that the choke is in proper operating condition.

5. *Reduce number of short trips to minimum:* Plan the driving. The engine consumes a lot more gasoline during the first mile it runs or until it warms up than it does during any other mile, at the same speed.

6. *Use the garage:* Even a car parked in an unheated garage will start easier and warm up faster than a car parked outside.

Maintenance

1. *Use radiator covers in winter:* Check with the car dealer regarding radiator covers. In most cases they provide quicker warm-up by raising the temperature of underhood air. This permits minimum use of choke; promotes efficient operation; and aids starting after short trips. Installation of such covers may be detrimental to chrome plating.

2. *Use correct grade of lubricants:* Winter operation on summer lubricants results in

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Rambling Throug[h] Sec[tions]

Pittsburgh Section Fifteen Years Old

FITTINGLY enough, "Today's Problems – Tomorrow's Expectations" was the theme of the three-session all-day meeting staged by the **PITTSBURGH SECTION** in celebration of its 15th birthday on April 25. All 14 past-chairmen were present. Ten speakers and numerous discussers who probed today's automotive developments in a search for the answer: "What of tomorrow?" were provided by John M. Orr, Duquesne Light Co., and his meetings committee . . .

With Chairman A. J. Imblum of the Section they prepared a rich, intellectual fare for a capacity audience totaling nearly 500 in the University Club, and brought speakers from as far as Detroit and New York to add to the galaxy of local talent for one of the most outstanding Section meetings in SAE history . . .

The morning session on Rubber Problems by K. D. Smith, B. F. Goodrich Rubber Co., and a down-to-earth discussion of Light Metals by Dr. P. V. Faragher, Aluminum Co. of America, scanned the horizon of tomorrow and predicted wide use of synthetic materials and aluminum alloys in the vehicles of the future. Discussion was led by Chairman C. R. Noll, Gulf Oil Corp. . .

Major-Gen. Stephen G. Henry, Director, New Developments Division, Office of the Chief of Staff, spoke at the luncheon and participated in discussion . . .

More level-headed engineering discussion followed the luncheon in the club, when Chairman Steve Johnson, Jr., introduced S. G. Page, Equitable Auto Co., who spoke on Fleet Operation, and later B. B. Bachman, Autocar Co. Mr. Page cited the economic imbalances of wartime fleet operation, and warned his audience to plan now for post-war fleet reconstruction. Mr. Bachman opened vistas of new things to expect during the post-war period . . .

A facsimile of the Ordnance Distinguished Service Award made recently to the SAE by the Army Ordnance Department was presented to Chairman Imblum as custodian for the Section by Past-Chairman Orr.

What ice needed to be broken was deftly smashed at the cocktail hour, at which some 20 Pittsburgh companies did honors as hosts to the members and guests, one and all joining in vociferous choruses . . .

How the Transportation & Maintenance Activity of the Society has been expanded to meet the demand for engineering services by the Army and the Office of Defense Transportation was described by President James, and General Manager John A. C. Warner explained how the Society is working on its post-war program . . .

Harold F. Blanchard, MoTor, put on the evening technical session which was a symposium on "Post-War Passenger-Car Design." Experts, seated at a table in front of the capacity audience, gave their opinions of what the motorist of tomorrow may expect, and answered questions from the floor. They were R. J. S. Pigott, Gulf Research & Development Co., who also served as moderator; Charles A. Chayne, Buick Motor Division; Maurice Olley, British Army Staff, and Max M. Roensch, Chrysler Corp. Mr. Olley's technical discussion was a masterpiece of humor – to the delight of even the standees who crowded the room to the doors . . .

(All papers presented at this Pittsburgh Section Meeting will appear in a later issue of the **SAE Journal** either in full in the Transactions Section or as digests.)

Close to 450 engineers – the largest turnout in **CANADIAN SECTION** history – crowded the ballroom of the Prince Edward Hotel at the annual Windsor dinner meeting April 21 . . . the reception suite, converted into the "SAE Tavern" was the welcome post for those who came to hear views of war as it is fought in the Middle East from Kuno E. Stockelbach, recently returned from activities in the Near East as Ford of Canada technical representative attached to G.H.Q., Middle East Command, Cairo, Egypt. . . Mr. Stockelbach dealt with technical problems encountered in supplying Army needs in the way of getting trucks and supplies to the fighting front in the area from the Suez Canal to the other side of Tunis . . . he spoke of labor problems, the methods used in truck reconditioning, the effect of desert climate on work, and touched on the necessity of seeing that all parts shipped from this country for fighting vehicles are properly packed. . .

Annual **CLEVELAND SECTION** golf outing postponed to June 2 . . . dinner at Chagrin Valley Country Club, door and golf prizes will conclude festivities of the day. . .

Added attractions at April 25 **KANSAS CITY SECTION** meeting, at which R. L. Ellinger, Transcontinental & Western Air, Inc., spoke on the progress in air transport design, were two Navy Bureau of Aeronautics combat films, a cocktail hour, and dinner. . .

Section Reports

TOLEDO'S largest technical meeting took place April 24 when the **DETROIT SECTION** met in conjunction with the Toledo Technical Council to hear a discussion of helicopters. . . The speaker was Mandel Lenkowsky, civilian assistant to Col. H. F. Gregory, in charge of helicopter development at Wright Field. About 650 attended the meeting, which was presided over by Robert P. Lewis, Spicer Mfg. Corp., president of the T. T. C. and its SAE representative. . . Toastmaster D. G. Roos introduced Mr. Lenkowsky, who said helicopters are being used to pick up wounded soldiers in front line positions, to drop supplies to isolated groups or to air crews which have crash-landed in difficult terrain, and to rescue flyers from such territory. Helicopter operation, he said, requires more finesse than piloting an ordinary airplane. Efforts were being made to simplify handling of the rotary wing ships by more effective controls. . . In theory, he said, the most stable helicopter is one with two rotors, each turning in direction opposite to the other. This type is now being produced for the Army and follows somewhat the lines

Detroit Section at Toledo

Among the guests and hosts of the Detroit Section Meeting held at Toledo with the Toledo Technical Council on April 24 were these prominent automotive engineers—

TOP: SAE President W. S. James congratulating D. G. Roos, SAE past-president and toastmaster for the large turnout. CENTER ROW, left to right: F. W. Marschner, treasurer of the Detroit Section, with J. E. Padgett, one of the Toledo hosts, and Chester Ricker, William B. Stout, and E. M. Schultheis, Detroit Section's regional vice-chairman. BOTTOM ROW: R. E. Carpenter, another Toledo host, at the speakers table with W. B. Fageol, Jr., Col. H. W. Alden, SAE past-president, and R. H. Prewitt, who spoke on the helicopter of tomorrow

established by the German FW-61, first really successful helicopter. . . Mr. Lenkowsky thought popular writers were somewhat optimistic, because in today's small ships the rotor wing tip moves at peripheral speed of about 400 mph, which, when added to the 100-mph forward speed of the ship, gives the forward-moving blade a speed of 500 miles. Increasing this speed, he said, rapidly reaches a point of diminishing returns as regards horsepower and fuel requirements.

Pennsylvania Hotel's Roof Garden was crowded to capacity with nearly 800 members and guests when the **METROPOLITAN SECTION** presented Past-President Arthur Nutt, who read a paper on Current Trends in Aircraft Powerplants. Chairman E. E. Husted of the Section received a replica of the Ordnance Distinguished Service Award from President W. S. James on behalf of the Section,

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hard starting, poor mileage, and increased wear.

3. *Use proper heat range spark plugs and have them serviced regularly:* Improper plugs or plugs in poor condition may cause hard starting, waste gasoline and induce knock.

4. *Have ignition checked regularly:* Faulty ignition causes hard starting and wastes gasoline. Improper timing may increase knock.

5. *Maintain proper engine temperatures:* Cooling System Thermostat, Manifold Heat Control, and Automatic Choke should be functioning properly.

6. *Keep carburetor and fuel system in good condition:* Erratic, unsatisfactory performance may be caused by plugged carburetor jets or restricted fuel lines. Clean filters and fuel lines of sediment and water.

It is more important than ever to follow in detail the latest recommendations of the car dealer with respect to special maintenance and seasonal adjustments which may be necessary.

Revise Rubber Specs

STANDARDS for Rubber Bumper Parts, including classification of materials and test requirements, has been undertaken by Section II of the joint SAE-ASTM Technical Committee A on Automotive Rubber under the chairmanship of E. J. Kvet, Baldwin Rubber Co.

Chairman G. H. Swart, General Tire & Rubber Co., heads Section IV on Rubber Classifications, much of the work of which has been completed for publication in the 1944 SAE Handbook. The Section has undertaken a program to develop supplementary inspection test requirements and data, with a system of suffix letters to denote these requirements. Specific data will be developed and the whole will be incorporated in the general Classification and Physical Characteristics of Natural Synthetic Rubbers.

Progress is being made by Section IX which has undertaken an assignment on the development of specifications for synthetic hydraulic brake cups. This work is headed by S. R. Doner, Manhattan Rubber Division, Raybestos-Manhattan, Inc., chairman of the section. The group is developing specifications and laboratory tests for synthetic rubber hydraulic brake cups. Plans are being made for an adequate series of field tests before synthetic materials will be released for procurement, however.

W. J. McCortney, Chrysler Corp., is chairman of Technical Committee A.

KLINGER REPRESENTS SAE On ASA Sectional Committee

J. D. KLINGER, Chrysler Corp., has been appointed an SAE representative on ASA Sectional Committee Z-11, Petroleum Products & Lubricants, succeeding J. B. Macauley, Jr., Pratt & Whitney Aircraft Division.

This substitution, approved by the SAE Council and recommended by Chairman J. H. Hunt of the SAE Standards Committee, was made to provide motor vehicle representation on the committee.

Other SAE representatives serving on the committee are A. L. Beall, Wright Aeronautical Corp., and A. W. Pope, Jr., Waukesha Motor Co.

AERO ENGINE Standards Appraised

RECENT conferences of representatives of the Engine Technical Committee of the Aeronautical Chamber of Commerce of America, the Army - Navy Aeronautical Board, and the SAE have resulted in the revaluation of some aircraft engine standardization and engineering advisory projects, and the clarification of others.

Because of the intricacies and interrelationships of airframe, engine, propeller, accessory, and materials specifications, and the standardization of their components, projects must be reviewed by the several interested Government agencies and industry groups.

As the scopes of projects have been extended at the request of the Army and Navy from time to time, industry committees working with the Government correlate the assignments in the interest of speed and prevention of duplication of effort.

The outline of basic procedures which resulted from the recent conferences include:

a. The Engine Technical Committee of the ACCA will "request technical assistance and information from the SAE Standards Committees, or other similar organizations as necessary, for proper expression of industry opinion."

b. Special ETC committees will not be formed by the Engine Technical Committee except for special assignments.

c. All SAE reports requested by the Engine Technical Committee will be forwarded by them to the Working Committee of the Aeronautical Board as "SAE Reports Endorsed by the ETC."

Aero Oxygen Equipment Report Issued by SAE

AERONAUTICAL Information Report No. 4, entitled Oxygen Equipment for Aircraft, has also been approved and was issued as of May 1.

This report, developed by SAE Committee A-9, Aircraft Air Conditioning Equipment, is a 12-page pamphlet illustrated with six drawings, and contains a list of 36 Government specifications covering oxygen equipment.

This work was done by the committee headed by W. W. Davies, United Air Lines Transport Corp., and composed of Joseph Jerger, Airplane Division, Curtiss-Wright Corp.; W. B. Klemperer, Douglas Aircraft Co., Inc.; V. C. Lundquist, Northwest Airlines, Inc.; R. C. Sylvander, Eclipse Pioneer Division, Bendix Aviation Corp., and P. C. Scofield, Lockheed Aircraft Corp.

Copies are available from SAE headquarters at 25¢ each.

VICE-CHAIRMEN APPOINTED

APPOINTMENT of vice-chairmen for the Air Transport Activity by the Metropolitan and Southern California Sections, as recommended by the Executive Committee of the Sections Committee, has received approval of the Council.

Rambling Throug[h] Sect[ions]

continued from preceding page

and turned the meeting over to R. Dixon Speas, vice-chairman for aeronautics. . . David Gregg, a member of Mr. Speas' advisory committee which has assisted in making Section history with five outstanding aeronautical meetings, was introduced. . . Mr. Nutt concluded that: Present ranges and types of aircraft engines will be satisfactory for many years . . . fuel injection is coming . . . airplanes must be vastly more controllable before they begin to compete with automobiles . . . helicopters will have to be greatly improved before they approach extravagant claims of their enthusiasts . . . gas turbines and jet propulsion may be expected . . . diesel aircraft engines have a long way to go before catching up with gasoline powerplants . . . only development of superior engines will permit survival in the post-war market, saturated as it will be with good engines . . . the military market will continue in the post-war era. . . Four fine combat films were obtained by Mr. Speas for the meeting. . .

Training and ability of the automotive industry to produce anything which is accurately specified on drawings has tremendously helped the war effort, according to F. E. Moskovics, A. O. Smith Co., told April 7 **MILWAUKEE SECTION** meeting of his three-year experience as technical advisor to the Army Air Forces, which he termed the most interesting phase of his career – a long and enterprising one. . .

"Invasion" – described at **NEW ENGLAND SECTION** meeting May 9 as one of the most exciting war films – showed the amphibious attack, initial landings and effects of Axis counter-attacks on men and materials . . . depicted the lengths to which German preparations have gone, and indicated growing fear of invasion that lies ahead for them. . .

While the United States has air supremacy today, production alone will not keep us ahead, Paul P. Johnson, Thompson Products, Inc., told New Englanders at same meeting . . . he described problems that had to be solved early in war when it was necessary to make airplane tanks that could not be punctured . . . Rubber industry engineers developed units that were self-sealing, making a vast difference in keeping planes in action. They also aided in production of 100 octane gasoline that gave American planes a big advantage over those used by the Axis . . . Trouble was encountered by vapor lock in the fuel lines of planes that stalled them at 15,000 ft. when they were trying to get to 30,000 ft. . . . Another handicap was sand that seeped into the airplanes in Africa, interfering with performance . . . that was overcome by filtering the fuel . . . speaker said peace would be won by mechanics who were being developed into real engineers through their work in keeping war units going . . .

Truck and tractor operation symposium of **NORTHERN CALIFORNIA SECTION** March 30 held in Stockton (Calif.), featured the following discussers: R. W. Goodale, who summarized experiences of Standard Oil Co. of Calif. in testing and development of fuels and lubricants for low temperature operation in Alaska in connection with the building of the Alcan Highway; Everett Jackson, Federal Mogul Service, who talked briefly on factors relating to successful bearing operation; S. B. Shaw, Pacific Gas & Electric Co., who spoke on activities of the ODT, and reviewed their experiences with magnetic detection of cracked parts and with rehabilitation of parts by cold welding and screw locking; W. G. Brown, Caterpillar Tractor Co., who discussed methods of preventing and removing scale from the jackets of watercooled engines; R. G. Hall, General Motors Corp., who added information to the talk on scale preventing compounds; S. E. Onorato, Union Oil Co. of Calif., who reported that the present gasoline is relatively involatile, being composed of highly cracked stocks having high sulfur concentrations; C. A. Winslow, Winslow Engineering Co., who stressed the provision of the largest filter possible and the selection of the proper type filter in maintenance of clean engine oil by use of filters; and D. N. Harris, Shell Oil Co., who stated there is little deterioration in oil quality due to the war, and of all petroleum products used by engine operators the most satisfactory are lubricating oils. . . E. F. Lowe presented with large gavel at conclusion of session. . .

Same Section presented talk on Modern Concept of Motor Fuels at April 17 meeting. . . Speaker Grant M. Wheeler, Tidewater Associated Oil Co., suggested that consideration be given to adjusting engines to the fuel in an effort to promote economy and improved operation . . . colored slides showing the molecular structure of typical components of fuels illustrated talk. . .

Charles R. Plum, a Westinghouse employee attached to Boeing Aircraft Co., delivered the paper on Gas Turbines and Turbosuperchargers by Dr. Sanford Moss, General Electric Co., at **NORTHWEST SECTION'S** April 7 meeting . . . history, reminiscences and partial accomplishments of gas turbine now in commercial use described. . .

Section Reports

OREGON SECTION went visiting April 28, when members were guests of City of Portland Municipal Shops . . . toured through each department, learning about work, special tools and instruments of shop employees . . . saw colored film of Skaggit Watershed country, from which City of Seattle derives power for most of its municipal light and power, and later were served sandwiches by employees. . .

Movies at **ST. LOUIS SECTION** meetings have become practically an established item . . . at April 11 session two sound films on diversified subjects presented: Bad Weather Flight Methods and How Not to Conduct a Meeting . . . story of the Sea Bees in combat at Tarawa shown at May 9 meeting. . .

Accomplishments of the War Production Board outlined by its vice-chairman, William L. Batt, at **SOUTHERN NEW ENGLAND SECTION** April 4. . . Described the struggles for peak production in early days of war, in face of confusion and inexperience. . . Despite cutbacks and manpower shortage, 1944 program calls for production 20% above that of 1943 . . . there will be a shifting of needs, transfer of production facilities that will put a severe strain on both labor and management, and there must be a necessary readiness of workers to move to other jobs or other localities in correspondence with changing production needs. . . One of speaker's post-war suggestions was that people should be trained in the solution of problems of distribution, especially foreign distribution . . . outstanding post-war economic problem he declared is maintenance of full employment in this country, which might properly be regarded as the nation's most important task after winning the war. . .

Illustrated lecture on diesel engines delivered by F. G. Shoemaker, Detroit Diesel Engine Division, at **SOUTHERN OHIO SECTION** meeting April 13 . . . covered history of the diesel, theory of operation, advantages of two and four-cycle systems, and discussed present and future applications of this source of power. . .

Exhibition of sound pictures showing glider operations in North Africa, en route to Sicily at time of its invasion, and maneuvers in the United States presented by Capt. R. F. Fedders, AAF, at Section's May 9 meeting . . . A travelogue based upon a trip the captain took to European theaters to observe gliders in use under actual warfare followed movies . . . he recounted personal experiences in North Africa and in Sicily, when he was a member of Gen. Hopkinson's staff, and indicated Sicilians who were adept at sniping anyone in uniform, were not as delighted to see British and Americans as we had been led to believe. . .

Official Army-Navy battlefront film program at **WASHINGTON SECTION'S** May 8 meeting. . . "Lifeline" (Army) – a camera record of opening attack against Rendova and Munda and magnificent job our medical men are doing in saving lives of our fighting men. . . "The Case of the Tremendous Trifle" (Army) – story behind the Schweinfurt raid and actual bombing of the German ball-bearing center. . . "Battle for the Beaches" (Navy) – narrated by Quentin Reynolds, depicted amphibious operations from Dieppe to the Marshalls, and actual cost in men and materiel in amphibious warfare. . . "Salute to the Navy" – a graphic review of men at sea. . . "Your Ship in Action" (Navy) – official combat film in color, which is saga of a fighting ship from time of its launching to its baptism of fire in Pacific. . .

Diesel engines for locomotives will require more servicing than steam engines, thought of Irvin F. Richardson, Socony-Vacuum Oil Co. at **MOHAWK-HUDSON GROUP** April 18 . . . stressed importance of using a high grade of diesel fuel rather than furnace oil in getting maximum performance with minimum maintenance. . .

Predicting that the helicopter will take its place in the world within the five-year period which will follow the war, A. T. Colwell, Thompson Aircraft Products Co., told **PEORIA GROUP** April 24 that though the speed of the post-war plane is unknown, post-war fuel will be called "triptane," and will have a 250 octane rating which is more powerful than that used now by the Armed Forces in war planes. . .

Joint meeting between Minnesota Industrial Chemists Forum and **TWIN CITY GROUP** April 20 attracted 189 representatives from both organizations, where Dr. Gustav Egloff, Universal Oil Products Co., talked on Petroleum in the War and Post-War World. . . Highlights of his discussion were: Our gasoline fuels are much better than those used by the Axis. . . Our natural resources of crude oil are tremendous . . . 30% total fuel production in this country is for aviation in 100 octane and 100 plus bracket. . . Automotive engineers must improve rapidly to take advantage of the new fuels, synthetic materials and new proposed 100,000 mile tires which have been developed. . . Tempo of research in the petroleum industry will increase in the post-war period. . .

Progress Made At Wright Field Meetings

THE SAE Committee A-3, Aircraft Valves, Fittings & Flexible Hose Assemblies, met April 19, 20, and 21 with Army and Navy representatives at Wright Field to discuss numerous detail problems pertaining to aircraft hydraulic tube fittings.

The meeting called by the Army Air Forces and the Navy Bureau of Aeronautics had been announced at the Chicago Hydraulic Meeting in March. L. J. Henderson, Weatherhead Co., chairman of the committee, had asked the airframe manufacturers and the fitting manufacturers to submit to him any comments or recommendations which they wished to discuss at this meeting.

Military representatives were enthusiastic about the work of the committee in making preparations for and handling this meeting.

Committee A-5, Aircraft Wheels, Brakes and Axles, also met at Wright Field, at the offices of the Alighting Gear Unit, on April 19. The main purpose of the meeting had been to coordinate the different practices and recommendations of the industry and the Army and Navy. The committee reached decisions on the proposed SAE wheel Standards subject to further recommendations to be obtained at the T & R Airplane Tire Standards Committee Meeting in Akron.

SAE Is Cooperating With Radio Engineers Group

THE SAE General Standards Committee's Electrical Equipment Division reported that the radio industry feels that frequency modulation and television will come into volume production shortly after the war ends and that ignition interference from vehicles will be detrimental to their reception on present broadcast bands.

A study of this situation has been inaugurated by the Radio Manufacturers Association with SAE cooperating to determine to what extent interference suppression should be built into motor vehicles and to establish standard practice for the same. No standardization exists at present.

A Subdivision of the Electrical Equipment Division is preparing a program of vehicle testing under this program and held its initial meeting in Detroit on May 8. The Canadian Engineering Standards Association has a similar project going ahead and their program is tied in with the RMA-SAE program through cross membership, interchange of correspondence and attendance at meetings.

One purpose of this project is to provide a suitable basis for suppression equipment in anticipation that there will probably be governmental regulation established when production of civilian vehicles is renewed.

New Aero Specs Issued

FOUR new and nine revised AMS (Aeronautical Materials Specifications) were issued as of May 1. Four of the revised specifications are revisions to NE (National Emergency) Steel Specifications.

Seven new and one revised AS (Aeronautical Standards) and ARP (Aeronautical Recommended Practice) were also issued May 1.

Shrouds and Air Cleaners Prolong Life of Aircraft Engines in Tank Services

by G. WAINE THOMAS
Continental Motors Corp.

National Aeronautic Meeting, April 5

(*Excerpts from paper entitled, "Aircraft Engines in Tanks"*)

EXPERIENCES of the Armed Forces and of Continental indicated that there was a need for using larger capacity air cleaner or cleaners on radial aircraft engines in combat vehicles. These should be located on the vehicle so as to draw the cleanest and coolest air available.

Engine Shroud Designed

This realization was the basis of the present induction air system and engine shroud design. Recirculation of hot engine air was found to be affecting the engine temperature considerably. Consequently, a new shroud was developed which closed off as completely as possible all openings by the use of felt, leather, or fabric seals. This was satisfactory. With the new shroud the engine inlet air is drawn from the fan compartment through tubes which are directed so as to eliminate some of the heavier particles of dust. The air passes from the fan chamber to the cleaners, then to the carburetor through metal induction pipes well insulated with cellular fiber jackets, all of which have materially assisted in the reduction of the inlet air temperatures. (See Fig. 1).

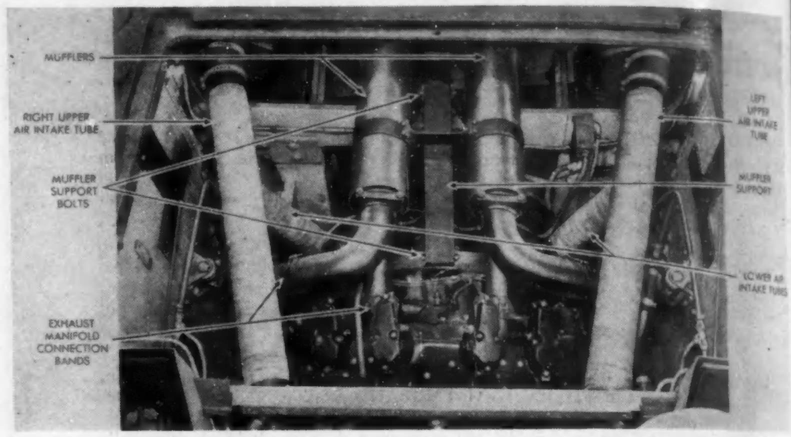

Fig. 1 – Engine compartment with top plates removed so as to show considerable of the induction and exhaust systems

Vapor Lock Combated

Fuel line leakage has been a chronic complaint. Vapor lock, too, has been experienced where combat vehicles were operated in ambient temperatures of 90 F or more. Vapor lock troubles have been greatly reduced by: (1) relocating the gasoline tanks and supply lines to cooler areas, (2) redesigning the supply lines to prevent vapor traps, and (3) submerging the fuel pump.

Vehicle design influencing accessibility directly affects maintenance. Proper cooling of the engine fuel and oil, and the elimination or reduction of dust content have definitely proved in recent design and installations to have improved the engine life to a point where 400 hr of uninterrupted operation has been attained.

Two questions often asked are (1) Why is a radial aircraft engine used in tanks? (2) Why are aircooled engines desirable in tanks?

The first question may be answered as follows:

a. It is often a cause for some surprise that weight of the powerplant is of major importance in a vehicle which weighs 60,000 lb or more and whose massive appearance attests disregard for weight. The importance of weight can be understood when it is realized that the difference between a liquid-cooled engine installation of conventional automotive type, using cast iron for the major parts, and the aircooled aircraft engine can mean a difference in armor plate over the entire surface of the tank of 0.15 in.

b. Cooling provision is easily arranged. The radial aircooled engine lends itself to the use of the high-efficiency axial-flow fan. It is fortunate that engine cooling air demands may be readily met by a fan running at crankshaft speed having a diameter somewhat smaller than the diameter of the engine. This makes for a comparatively compact and mechanically simple cooling set-up.

The second question may be explained accordingly:

a. It is estimated that weight saving of an aircooled installation over a liquid-cooled powerplant making allowance for equal type of design and materials is about 50%.

b. Aircooled engines are less vulnerable to damage by hazards of warfare. It is obvious that damage to the liquid-cooling system can easily put a tank out of commission, while severe damage to the aircooling system can occur with negligible effect on the operation of the powerplant. It has been reported that bomb explosions at some distance from a tank can damage the water radiator so that operation must be discontinued.

c. Cooling is accomplished with less expenditure of engine power on aircooled engines. Aircooled aircraft engines are commonly operated with metal temperatures in the head region of about 500 F and 350 F on the cylinder barrel. Assuming a cooling air temperature of 120 F, such as encountered in desert operation, an average temperature differential of 305 F results. This compares with approximately 230 F water for the liquid-cooled engine, resulting in a differential of 110 F. This means about three times higher airflow to accomplish the cooling for the liquid-cooled engine. Since consideration of radiator size dictates a pressure drop of the same order as the pressure drop across the aircooled cylinders, the power required for cooling is three times as high.

Also, greater space within the tank hull is required to pass the greater quantity of air. Comparison of actual performance figures shows from 200-400% higher fan power required for liquid-cooled installations with about 200-300% more airflow required. The aircooled installations do not utilize the air as economically as is possible, or these percentages would be greater.

d. Service considerations are better on aircooled engines. In desert operation, water may be as scarce as fuel, therefore the supply problem is considerable. Also, in dusty operation, liquid-cooled radiators clog, with direct reduction in cooling potential. On the other hand, aircooled cylinders may clog with only minor effect on cooling. The aircooled engine dodges the plumbing problem entirely and does not substitute an alternative problem.

Technical IDEAS

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Filters, Exhaust Scavengers, Decked Pistons, Used to Keep Engines Clean

by LANDON B. BOYD
DeLuxe Products Corp.

■ Mid-Continent, March 17

(Excerpts from paper entitled "Recent Developments on Accessories and Parts for Keeping Oil and Combustion Chambers Clean and for the Use of Post-War Fuels")

WITH more than 10 years experience in removing asphaltenes from oil, we believe it is advantageous to filter detergent oils if their chemical balance is not disturbed, and our method of depth filtration, through untreated, chemically pure cotton fiber, seemed admirably suited to the task. An increase in the period during which oil and fiber were in contact was found necessary. By recalibrating the flow to decrease it, we obtained the result desired.

With the idea of saving base space and providing greater depth, we developed our DN line, in which each container holds two cartridges, one atop the other. This arrangement not only worked better with mineral oil, but thoroughly cleaned the detergent oils in a manner impossible before. The conclusion is that well-filtered detergent oils are a positive assurance of cleaner engines.

As a result of experiments in exhaust refinements undertaken to improve combustion, the Clear-Ex was developed, involving a new principle of exhaust control and a definite factor in minimizing contaminations.

The Clear-Ex (clear exhaust) is an automatic air valve requiring no adjustment, which introduces air into the exhaust system of an internal-combustion engine to facilitate the complete burning of carbon monoxide gas and to dilute carbon dioxide gas always present in the combustion chamber. The exhaust vacuums draw air through the Clear-Ex into the exhaust manifold, and the contents of the exhaust system are diluted by air. Gases drawn from the exhaust manifold into the intake system at the period of valve overlap are also diluted. Air expanded by the heat of the exhaust system displaces a greater volume of burnt gases.

With Clear-Ex in use, low-speed detonation is reduced so quickly that we are inclined to credit the cooling effect of the air input to the cylinder via the exhaust valve rather than the cleaning up of the combustion chambers. Detonation is either completely eradicated or greatly diminished immediately after Clear-Ex has been installed and before the engine has had time to clean up. In conventional operation, abrasive materials deposited on the interior of exhaust manifolds and pipes are dislodged by the exhaust blast and returned to the cylinder by the action of the exhaust vacuum. This abrasive dust wears pistons, rings, and cylinder walls. The air supplied to the exhaust system by the Clear-Ex has an oxidizing effect on such deposits, thereby holding them to a minimum.

An experiment to prove that air gets into the cylinders from the Clear-Ex via the exhaust system was made by piping the atmospheric vent of the Clear-Ex to a container of kerosene. By simply loosening the spark plugs in their sockets and permitting them to leak, the kerosene which was drawn through the Clear-Ex via the exhaust manifold and into the cylinders was blown by the loosened spark plugs. This test was conducted on a Dodge engine, pulling through the fluid drive at 800 rpm, carburetor throttle half open. Carbon tetrachloride permitted to flow through the atmospheric vent of the Clear-Ex will stall an engine; further proof of exhaust backwash.

The first part of this paper was devoted to the effect of oil and exhaust gases on engine cleanliness and efficiency. We will now deal with the same subjects as affected by the copper top piston.

To determine the effect of the copper top piston on engine cleanliness and efficiency, we made several attempts to braze copper on iron. After a series of tests, we found that the heat factor on any piston, whether iron, aluminum, or copper decked, increases as the square of the diameter. The heat of combustion is so rapidly distributed over the entire surface of the piston head that it does not have an opportunity to conduct any heat to the parent metal, and following the combustion stroke, more complete scavenging is accomplished. Therefore, on the intake stroke, the deck is cooled so quickly that a higher volumetric efficiency is attained.

Heat normally lost in the jacket water and the transfer of heat to the rings and oil is converted to useful work. This is further proved by the fact that the same horsepower is obtained with less fuel consumption, and conversely, with the same fuel *more* horsepower can be obtained.

The design of lighter iron pistons is made possible with the copper deck on the piston, because no heavy head thickness or ring belt thickness is necessary for conducting heat to the ring belt. Thus, the piston can be designed to withstand only operating loads, which naturally decreases the weight of the iron from 25 to 50% by saving metal in those sections.

If a piston runs cooler, then less clearance is necessary and a careful correlation of the tests made have resulted in a recommended skirt clearance of 0.0005 in. to each inch of piston diameter.

Another important factor is that land clearance should be just as close to the cylinder wall as possible to prevent the flame of combustion from reaching the top ring. This developed a formula that half of the top land clearance necessary on iron pistons can be used when the copper deck is incorporated. Pin fits in the piston must be made with more clearance than usual, as all tests show the piston bosses run cooler than the pin. Therefore, sufficient clearance must be allowed so there will be no danger of seizing.

Blame Operating Troubles To Wartime Maladjustment Of Engines and Gasolines

■ Southern California, Feb. 24

(Summary of "Information Please" type discussion on How to Live with Today's Gasoline, with Carl Abell, Ethyl Corp., serving as technical chairman and interlocutor, and a committee of experts composed of G. F. Olsen, General Petroleum Corp.; Ralph Eberly, Chrysler Motors of Calif.; Glenn Jones, Chevrolet Motor Co.; Frank Elliott, Ethyl Corp.; and Cecil Ellis, Southern California Edison Co.)

MANY of our present difficulties with gasoline are due to the fact that our engines were designed for higher speeds, higher operating temperatures and more volatile fuel than can now be provided, the speakers disclosed. We cannot materially change today's operating speeds, they said, so we must look to adjustments and changes in the engine itself for the necessary adaptation.

Today's operation as far as passenger cars are concerned, it was pointed out, is practically parallel to winter operation in cold climates under normal driving conditions of the past. Therefore, the first step in improvement should be a thorough "winterizing" of the car. This should include adjustment of the automatic choke and pump-stroke of the carburetor to winter positions,

concluded on p. 41

for ENGINEERS Given at SAE MEETINGS ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

PRODUCTION PROCESSES GENERATE Q &

by T. J. JAWORSKI,
Akro, Inc.,
H. H. KAMPH and
C. P. BROWN,
Charles R. Hadley Co.

▪ Southern California, March 31

(Excerpts from a three-way discussion which followed a paper of Mr. Jaworski's on "Design of Production Engineering Systems." At the request of Mr. Jaworski, Mr. Kamph and Mr. Brown participated with him in answering the following questions on the relationship of production control, material control, planning and accounting)

VARIABLES, due to the exigencies faced by our nation at war, have required a flexibility in production processes. The questions and answers digested herewith propound a new philosophy and a resultant practice which has proved successful.

Q: *What wartime barriers tend to break down planned flow of production?*

A: There are at least 10:

Material procurement uncertainties due to shortages and unbalanced distribution;

War Production Board's artificial inventory limitations set up by the Controlled Materials Plan and Production Requirements Plan;

Manpower shortages in certain areas. Selective Service, and deterioration of adequate skills;

Artificial manpower ceilings created by the War Manpower Commission;

Equipment scarcities;

Artificial WPB limitations on equipment;

Unprecedented demands upon outside production facilities;

Disappearance of overtime cushion through the use of two 10-hr or three 8-hr per day shifts;

Frequent design changes, and

Frequent schedule changes.

Thus, production control has been deprived of hedges which formerly acted as factors of safety or cushions whenever scheduling ran off the track.

Q: *Can you name some other elements that have retarded the successful use of production control?*

A: Industrial engineers must work with both the physical tools in dealing with actual production, and forms and records, or so-called "paper," in dealing with the planning, control, and cost. Impatience with "paper work" often manifests itself in the design and utilization of a single, all-purpose system, or too great reliance upon a given device of charting, signaling, or reporting.

Implicit belief in a single system or method causes scrapping production control systems which may contain many elements necessary to successful operation.

Approach to widespread changes in existing production control systems must be made cautiously. There is no perfect system, yet no system is wholly imperfect. Make decisions effecting major changes only after a thorough analysis and review of records already in use as related to the functions which they are supposed to implement. This leads to fewer changes than would otherwise be contemplated. Stagger necessary changes to correct most urgent things first and less urgent remedies are applied without completely upsetting routine, personnel, or production.

Q: *How should barriers against full use of production controls be broken?*

A: First, we must isolate and study the limits or barriers within each function. Production control has certain basic, unvarying functions such as planning, estimating, and progress control. We must isolate steps related to each function that may cause production control breakdown, starting with estimating and planning, and working through progress control.

The common weakness of these elements is rigidity or inflexibility, yet any business operation is inherently variable. These variables have an effect on the profitable combination that must be selected.

Current production control does not provide the flexibility required by the constant shifting of the variables, nor does it permit optional selection of new combinations of these factors as emergencies arise.

However, sufficient flexibility may be introduced into all functions of production control, to meet constant and inevitable variables. This flexibility must be great enough to take care of the maximum limits of the variables, but not so great as to disturb the primary elements of control.

Q: *Please develop those elements related to these functions that may cause breakdowns or retard success.*

A: Let us take a job manufacturing shop. Preliminary planning and estimating determine the most accurate possible cost figures and bid or selling prices. As a byproduct, we must analyze the production to determine parts fabrication, tooling required, subassembly, and final assembly, and also to determine the operations routing and their elements.

Hasty preliminary planning, estimating, and routing is a primary cause of failure of production control. Haste may result in inaccurate costs and bid prices – either too low for profit, or too high to receive the award. Estimating job-wise deprives the planner of a blueprint which can be prepared to meet the estimated price, as visualized by the estimator.

All factors used relate to *probable* consumption, rather than *ideal.* A factor of safety must be added to total cost to take care of the difference between the estimated probable usage and any *less* economical actual contingency.

Primary operations, such as cutting, drilling, and tapping are listed, as well as their elements. Time may be estimated for each on the basis of compiled standards, either from available handbooks, actual shop experience, or available cost history.

Most important are the natural factors of safety, or cushions, these must be established at the point of preliminary planning, for it is within these functions that all manufacturing operations take birth. Some of the variables:

The lot quantity;

Optional equipment wherever practical may be considered and specified, and

Optional methods of production should receive attention at this point. Optional tooling, material overages (to cover loss in production) should be provided.

These variables may be provided for by adding to the probable estimated costs, a cost percentage increase based upon the cost experience of the plant.

Q: *How are schedules set?*

A: At this point setting an overall schedule needs some charting technique. We use a modification of the branch diagram. It:

Sets forth in its several equalized vertical divisions the several stages of production;

Shows the relationship of parts and assemblies within each production stage, and in the several stages;

Shows a schedule based on the maximum and minimum lot quantities. These schedules are provided with respect to each part and assembly independent of every other time scale on the chart.

Besides being a guide or template to determine the entire production schedule for any lot in any quantity at any time, this chart also is a comprehensive picture of the status and flow of the entire job.

Q: *How are lot quantities selected?*

A: This is influenced by the load condition of the plant. The minimum quantity specified in planning should not be reduced without authorization from planning. If the maximum lot quantity can be used, it may be selected by Production Control.

The job order authorization may be written directly from the estimate previously made. Having determined the lot quantity, total running time, and the grand total of operation time, including setup, for each operation the data may be extended.

The start and due dates are determined by reference to the production schedule. Then, the scheduled start and due dates for each operation may be set from the estimated time. Start and due dates are set end to end, which automatically provides a factor of safety or cushion for scheduling. Thus in an emergency, operations may be lapped at any point to meet the due date of the lot.

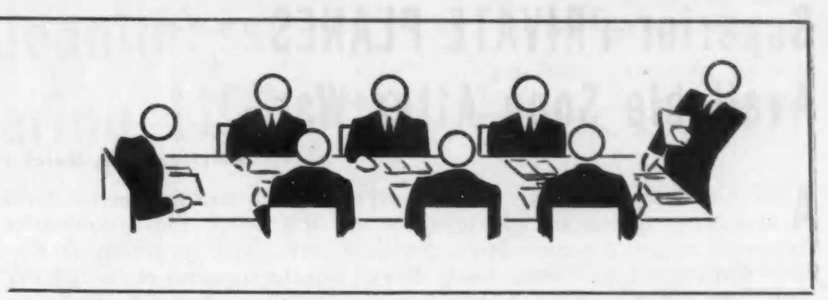
Q: *How is machine time made available for the periods in which the operations are scheduled?*

A: We use a load ledger which is broken down by machine or work center. It is further subdivided by weekly periods.

Q: *Does the load ledger reveal a week's load at all times?*

A: Yes. Daily completions are deducted and enough additional work is entered into the ledger to provide information on load conditions for a week in advance of today.

SESSION



Q: *How is this record posted?*

A: Futures are posted from the scheduled progress charts as new jobs are added to the backlog. More accurate information is not possible at this point. The current-week ledger forecasts performance accurately. As we approach actual operation the cushions are being narrowed. Our percentage of error in determining these probabilities is narrowed because we can focus most of the factors into the picture. This record is corrected on the basis of actual job orders.

If the load ledger shows the machine or the work center specified as the probable machine or work center, is loaded to capacity, it becomes necessary to modify the job authorization. The next best equipment then is specified. The lpading is accomplished entirely on an estimated basis.

Q: *How are the various job authorizations started?*

A: Automatic triggers are used for job order preparation. The basic trigger authorizing production is the scheduled delivery date of a given quantity of the finished product. Subsequent triggers can be established by maintaining integrated inventory controls. A production ordering flow chart, posts the shipping schedule as a requirement against the finished goods inventory control. Then final assembly orders are authorized. When the order point is reached on any subassembly or part, production is authorized for that subassembly or part.

Raw material and purchased parts are eventually procured through this sifting down of requirements through the successive stages of production.

Lot quantities should not, under present governmental regulations, contemplate a longer period of production than 60 days. Lead time of production stages must not be overlooked.

Q: *Will you trace the actual control of production after the release of the production order?*

A: The production Control Flow Chart consists of a parts list (for each assembly stage) a production order dispatch copy, a production order control copy, and as many production order shop copies as may be necessary to take care of simultaneous operations in the shop.

Until the job is ready to start, a copy of the parts list, the dispatch copy of the production order, and the control copy of the production order are held by job order, signaled to start date. Shop copies of the production order serve as a detailed breakdown of the loaded ledger.

After release the parts list, the dispatch copy of the production order, and all shop copies of the production order go to dispatch. The dispatcher files his copy for follow-up and operational moves, and the several shop copies by department. These are released as required to the several departments.

Production and inspection reports and time cards originate in the shop.

One copy of the requisition is used to post the issue of materials, while the other, after pricing, is routed to cost. At this point it is met by the time cards, so that the cost records may be kept current.

At the point of job close-out, the dispatch copy of the production order is filed with one copy of the parts list by item number. One or more copies of the production order and another copy of the parts list are filed by job number. These files are invaluable in the post-production analysis of job performance.

Q: *What is the post-production stage?*

A: This consists of a comparison of actual costs with estimates, an analysis of reasons for deviations and reports on deviations are made to management.

Q: *In conclusion, what are the principles of standard production control design?*

A: Critical care in preliminary planning and estimating is necessary. The crystal ball technique is rarely effective.

There must be realism in determining units of consumption. Probables, rather than ideals should be used throughout;

A further factor of safety, an added cost percentage to cover the maximum actual limitations as compared with the probables, must be included. Any lot in any quantity must be scheduled at any time to definite calendar dates;

Scheduled start and due dates for operations should be set with sufficient cushion to cover maximum limitations, and a cushion should be provided in the form of operational lapping to be used only as and when the emergency arises;

Production orders must be prepared only sufficient in advance of release to provide for material procurement; and

Introduction of these flexibilities into any schedule permits the absorption of emergencies and variables without materially affecting important due dates, and without upsetting the schedule as a whole.

OPERATING TROUBLES

cont. from p. 39

changing lubricants to the lightest grades specified by the manufacturers, and special attention to any adjustments affecting the operating temperature of the engine, particularly to see that the manifold heat control valve provides maximum hot spot effect.

Water jackets temperatures in the "minimum 170 maximum 200" range were recommended, controlling with thermostats in the water jacket outlet preferably, but by means of radiator covers if necessary. It was also suggested, where no temperature equalizing device was incorporated in the intake manifold, a sheet metal baffle to protect the front end of the manifold from the fan blast should be used.

The fallacy of indiscriminate enrichment of carburetors was discussed, as this will only result in waste of gasoline. The needs of starting and warmup can be provided by adjustment of automatic choke or manipulation of hand choke, and by setting the accelerating pump in the long stroke hole, and setting the idling where it should be. Also, any gum in the gasoline will have a chance to deposit on the hot spot, and in many cases it has built up to a considerable thickness. This deposit has a high insulating value, and may even convert the hot spot into the coldest spot in the manifold. Hence, it should be thoroughly cleaned out, preferably by sandblasting.

Troubles from gasoline gum localized in fuel pumps and carburetors should be handled by overhauling units, the experts advised, using solvents to clean parts where feasible, and replacing parts having small tubes or orifices. Intake valves need more frequent removal of gum than in previous years. The gum situation has improved recently, but precautions must still be taken.

Spark plugs, too, have a greater tendency to foul under present conditions. If bothersome, this can be overcome by using hotter spark plugs.

Frequent knocking complaints were reported by 36 out of 40 automobile agencies, even on premium grade fuel. The speakers explained that today's driving conditions and the nature of present gasoline result in increased carbon deposits. Owners must reconcile themselves to more frequent carbon removal. Late ignition timing was recommended only in case other measures fail to provide a job acceptable to the owner. It is generally preferable to time the ignition where it gives maximum efficiency, and then drive the car so it does not knock.

Factors affecting corrosion inside the engine were discussed, and the steps to prevent most forms of corrosion now prevalent were outlined, including thorough cleaning of the crankcase breather, both inlet filter and outlet downspout, the application of a positive means of withdrawing fumes from the crankcase if experience indicates its necessity, the general raising of crankcase temperatures by increasing engine temperatures, and drainage of the crankcase at least as often as suggested by the instruction book for operation.

The program concluded with the statement that commercial vehicles are operating harder now than ever before, with attendant problems arising from too much heat instead of too little.

Superior PRIVATE PLANES Available Soon After War

Metropolitan, March 2

AIRCRAFT engineers agree that current accelerated developments on Army and Navy aircraft are telescoping aeronautical design and experience of decades in normal peacetime into a few short years. This symposium on Personal Airplanes of the Future clearly showed that the engineers of the industry have their eyes focused on the future, and demonstrated that new fabricating techniques and materials will play important roles in the design and construction of tomorrow's private aircraft.

Wide Choice Available Soon, W. D. Hall, Aeronca, Says

HOW the "explosive" rate of current aeronautical developments will make available an elaborate choice of types and operating characteristics of private planes was explained by William D. Hall, chief engineer, Aeronca Aircraft Co.

Both the fixed wing and helicopter types will be available during the post-war period, although he believes the latter will be a long way off. The following types of the former will be available to the post-war public:

1. Low-powered, inexpensive training type, with either tandem or side-by-side seating; selling at about $1000;
2. Medium-priced, medium performance; super-safe; two to five place; selling from $1500 to $3000;
3. High performance, two place side-by-side; low-wing, retractable gear; selling for about $2000.

In general, the best airplane will be a compromise between safety, cost, performance, dependability, and comfort, he said.

(Digest of this paper, delivered previously at the 1944 Annual Meeting, appeared on page 26, *SAE Journal*, March.)

W. L. LePage Sees Helicopters to Fore

INHERENT advantages of the helicopter as a personal airplane will make this a popular ship of the post-war era, W. Lawrence LePage, president, Platt-LePage Aircraft Corp., believed. He did not expect the immediate post-war sales of this type of airplane – or even the fixed wing types – to be large, but both will find a growing acceptance in the air age of tomorrow.

In its simplest terms, the helicopter offers safety, smoothness of operation, and a great versatility in take-off, landing, and flying in bad weather – at the sacrifice to speed, he said.

Although it is generally not recognized, the rotary wing aircraft is getting the benefit of a great deal of practical experience with our Armed services. Despite the age of the principle, the actual development work is new. "But we are feeling surer and surer of its future as we are successively solving detailed mechanical problems in the development and manufacture of helicopters," he declared.

"Contrary to the opinions of some of the leaders in this development, I do not believe that the helicopter will be found to be easier to fly than are airplanes. But the techniques can be readily learned by any good motorist, and the characteristics of take-off and landing are such as to make learning relatively easy. For example, a novice need only lift the machine a few inches off the ground at first, hover, move around, and land. As he gains more confidence he will rise further and fly forward, backward, and sideways until he is accustomed to his controls, the feeling of flying, and judgment in landing. From this point of view the helicopter is the ideal airship," he pointed out.

From the standpoint of economy, the helicopter has every advantage over fixed wing ships of like size. If the owner is willing to forego speed for low operation cost, he will be interested in the advantages of the helicopter type of airship, he believed.

"However, it seems to me that an important role of the post-war helicopter will be in air transport," he said. Dual rotors, mounted left and right of the fuselage on outrigger members, will give the machine great weight lifting power, and will be used for both passenger and freight carrying. There is no reason to expect that speeds of a large craft could not be raised to about 300 mph. Furthermore, the helicopter lends itself to better design of payload space than can be had in conventional fixed wing ships. Loading and unloading facilities would be far better, and take-off and landing could be made in many places inaccessible to large fixed wing airplanes," he concluded.

F. T. Kurt, Grumman, Cites Pilots' Preferences

TOMORROW'S private airplane owner will have four basic wants which the successful personal airship manufacturer must satisfy if he is to be successful, Franklin T. Kurt, Grumman Engineering Co., said. They are:

1. Simplification of regulations, because he wants to fly freely. The airship builders, both as individual industrialists and collectively, must participate in the trend of tomorrow's regulations to assure their simplicity. The Civil Air Regulations require about 20,000 words, the Ten Commandments less than 200.

Current attempts to classify airworthiness into categories are laudable and should be extended. To date, regulations tend to retard developments.

2. Tomorrow's pilot will want to fly simply. He must know where he can fly as an amateur, and where he cannot fly unless he has the skill to possess higher licenses and ratings. He will want these areas marked clearly on his charts.

Furthermore, he will want a clearer separation between areas where flight plan is required at all times, and where he is free to fly without flight plan any time. This he will need, in other words, on a *where* basis – not on a *when* basis. He will demand the right to fly outside or under the airway at any time and under any weather conditions.

Present limits defining instrument and contact conditions are not a correct measure of prevailing hazards, and he is irritated when these limits are irregularly defined by various people at different airports.

3. The airplane owner of tomorrow will need plenty of landing places.

He will need many more airfields than were available before the war, and he will want many landing strips along highways to augment landing fields. Even on Manhattan Island, a 2000 by 200 ft landing strip could be built along the shore of the Hudson River at about 150th Street. It would be far less costly than the present highway there, and could be built by extending the shoreline into the river with piling and filling in.

4. Tomorrow's prospective airplane owner will want a good investment.

"He will not be foolish enough to want a cheap airplane, but he will want a good one which can be used at a low cost and used for more hours a year than he was ever able to use his old airplane," Mr. Kurt pointed out.

"The most costly thing about flying is an airplane that is not used."

By the same token, he will be interested in a twin-engine ship, because he will be able to do more night flying. He will want a ship that is easily maintained at a reasonable cost. If a slight error in skill, such as using his brakes too hard, costs him a $1000 or $2000 repair bill, we cannot expect to sell personal airplanes in large numbers. We were asleep on that one before the war.

"It now looks like the tricycle landing gear will be the solution to a part of more flight hours per year because of the stability of this type of gear in cross winged landings. We shall probably see considerable development in wing loadings, and light planes may be even lighter by using much smaller wings," he declared.

The most successful private plane will take advantage of all possible recent developments in aerodynamics and powerplants. Flaps, controllable pitch propellers, retractable landing gears, superchargers on small engines, and even variable shutters for cooling will earn their way eventually on the little airplane.

However, tomorrow's owner will not want to take a memory course with his airplane, and he will have to be provided with a single lever to control all accessories, with notches marked "take-off," "climb," "cruise," and moving backward with notches marked "approach" and "land," Mr. Kurt believed.

He will want speed, but probably in increments of not more than 20 hp for each new plane.

Maintenance advantages will make him want all metal construction instead of fabric covered wings and tail surfaces. Because of the need of leaving his airplane outdoors when not in use, rust-resisting metals and the possibility of folding wings will be attractive to tomorrow's airplane owner.

"The future of the personal airplane business looks very bright from here – and it is going to be a lot of fun," he concluded.

Precision and Cleanliness Essential to Bearing Life

by E. G. JACKSON
Federal Mogul Service

▪ **Northern California, March 30**

(Excerpts from paper entitled "Conservation of Engine Bearings")

DURING the past two years, bearing manufacturers have been limited in the use of bearing lining materials to certain lead-base alloys for most bearings and comparatively small quantities of tin alloys and copper-lead mixtures for some of the more critical engines.

The necessary substitutions of lead-base linings in bearings that formerly were lined with other materials does not mean that the lead-base lining is inferior. It has its particular field of usefulness and has been used for a number of years with gratifying success in certain applications and will undoubtedly continue to be used, where applicable, for years to come.

Lead-base alloy is not, however, a universal bearing lining, nor can any other known lining material be considered a universal lining. Each of the known lining materials has its own particular usefulness, as can be seen from a study of Fig. 1.

Since it may be some time before the full range of bearing materials is again made available, and since much of the difficulty currently being experienced with engine bearings may be attributed directly to improper procedures of installation, a review of some of the more common causes of bearing failure brought about by faulty installation appears to be indicated.

With the exception of excessive temperatures, dirt is probably the greatest enemy of bearings. A minute particle of dirt or hard carbon between the bearing back and its saddle may result in premature failure by forcing the bearing lining against the journal. This will cause metal to metal contact at that point, and will form an air space between the bearing back and saddle, preventing dissipation of heat into the engine mass. Also, foreign particles embedded in the lining material form ridged craters whose lips project against the revolving journal, causing metal to metal contact. The foreign particles act as an abrasive tending to wear the shaft.

Another cause of premature failure is often found where bearings have been installed in an out-of-round connecting rod or saddle bore. Since thin-wall precision-insert bearings follow the contour of the bore in which they are installed, an out-of-round rod or saddle bore will naturally result in an out-of-round bearing bore, which is, of course, just as harmful to the bearings as an out-of-round crankshaft would be.

Although the effectiveness of lubrication is provided by supporting the journal with the oil films and wedge, so that theoretically neither the journal nor the bearing should develop any wear while the lubricating system is in full operation, the fact remains that crankshafts do wear and bearings fail. Partially, at least, this wear and failure may be traced to a breaking of the oil film, temporarily or permanently, by the introduction of foreign matter into the bearing, as well as from other causes.

Therefore, for the purpose of obtaining the greatest possible life from the available supplies of engine bearings, greater precision and cleanliness than ever before should be observed in the installation procedure.

The following installation rules are recommended:

1. The crankshaft must be of adequate hardness.

2. There must be ample radial oil clearance, and to be sure of this, the crankshaft diameters must be accurately known. Ample end clearance at the thrust bearing must also be obtained.

3. If interchangeable (precision) type main bearings are to be used, the crankcase bearing saddle bores must be round within 0.002 in., and in true alignment to the extent that an aligning bar ground 0.00075 in. under the case bore diameter can be turned by hand with the aid of a 15-in. pipe extension after the caps are tightened down over the bar. If the saddle bores are out-of-round and not in alignment, bearings must be align-bored in place so that the discrepancies can be compensated for. The align-bored finish must be smooth, as obtained with a 0.002 in. feed per revolution using a tool bit having a 90 deg nose with the sharp point stoned off. Desired profilometer reading of finished surface – 30 to 40 micro-inches.

4. If interchangeable (precision) type connecting-rod bearings are to be used, the rod bore must not be more than 0.002 in. out-of-round. If the out-of-roundness exceeds 0.002 in. the bearings must be finish-bored to the correct size in rods. The bored finish must be smooth.

5. Avoid cap misalignment sidewise by using wrench sockets of the proper diameter.

6. Tighten all bearing bolts and nuts with a torque wrench to uniform settings (as given by the wrench or engine manufacturer).

7. Oil gage pressure must be up to original specifications.

8. Engine water jackets, radiator, and hose connections must be free and open to insure normal cooling water temperatures.

9. If a reground crankshaft is used, the journal and crankpin surfaces must be smooth, which means they must be ground *and* lapped.

10. All engine oilways must be thoroughly cleaned out.

11. Connecting rods must be in correct alignment. The crankpin bearing bores and piston-pin bushing bores must be parallel within 0.001 in. in 6 in. and the twist between these bores must not exceed 0.001 in. to 6 in. The piston gliding surfaces must be square with the axis of the connecting-rod bore.

12. Coat the surface of a new bearing liberally with a heavy engine oil (SAE 50), and also the crankshaft at assembly. In a newly rebuilt engine, inspect the bearing installation with a pressure tank which will force oil at a predetermined pressure through the lubricating system. The end leakage at the bearings can be observed, all bearing surfaces will be well lubricated before the engine moves under its own power and a great deal of dirt which might damage the bearings will be flushed out.

13. Select a lubricating oil on the basis of competent engineering advice and then maintain it properly. There is no lack of suitable lubricants.

14. Break in a rebuilt engine with the same routine and care as a new one.

15. When the time for periodic inspection arrives, do not worry if the bearing surface shows some discolorations and deposits. Determine their nature, clean up the sound bearings and reassemble them.

DESCRIPTION OF BEARING METAL	MAXIMUM PERMISSIBLE UNIT PRESSURE	MINIMUM PERMISSIBLE Zn/Pmax	MAXIMUM Pmax V	OIL RESERVOIR TEMP.	MINIMUM CRANKSHAFT HARDNESS	AFFECTED BY CORROSION
TIN BASE BABBITT COPPER ... 3.50% ANTIMONY ... 7.50% TIN ... 89.00% LEAD (max) 0.25%	1000 psi	20	35000	235° F	NOT IMPORTANT	NO
	* STANDARD QUALITY BEARINGS					
TIN BASE BABBITT SAME COMPOSITION AS ABOVE	1500 psi	15	42500	235° F	NOT IMPORTANT	NO
	† ALPHA PROCESS QUALITY BEARINGS					
HIGH LEAD BABBITT TIN ... 5 to 7% ANTIMONY ... 9 to 11% LEAD ... 82 to 86% COPPER (max) 0.25%	1800 psi	10	40000	225° F	NOT IMPORTANT	NO
CADMIUM-SILVER SILVER ... 0.75% COPPER ... 0.50% CADMIUM ... 98.75%	OVER 1800 AND UP TO 3850 psi	3.75	90000 AND UPWARDS	260° F	250 BRINELL	Not likely if temperature is maintained as specified and proper lubricating oil is used
COPPER-LEAD COPPER ... 65% LEAD ... 35%	OVER 1800 AND UP TO 4500 psi	3.75	90000 AND UPWARDS	260° F	300 BRINELL	

* "Standard-quality" bearings are those which are produced as competitively priced products.

† "Alpha Process" quality bearings are those which are produced by such methods as will result in maximum performance expectancy, and with cost a secondary consideration.

▪ **Fig. 1 – Chart showing field of usefulness for various bearing metals**

PRE-WAR STATUS TO MARK START OF POST-WAR'S LUBRICATION PROBLEMS

by B. E. SIBLEY and E. W. CAVE
Continental Oil Co.

■ Colorado, Feb. 15
■ Kansas City, March 21

(Excerpts from paper entitled "Present and Post-War Lubrication Problems")

IMMEDIATE post-war lubrication problems will, in general, be a continuation of where we left off after Pearl Harbor, and will be mainly concerned with the following:

1. Pistons: Compression rings—ring life and cleanliness are affected by quality of the combustible charge, especially with reference to freedom from abrasive dirt; hence, the proper servicing of an efficient air cleaner will be beneficial.

Over oiling will promote ring fouling and increased combustion-chamber deposits.

Ring sticking and wear will be affected both by the character of the lubricant with reference to engine lacquer and other objectionable deposits.

Fuel gums are also an offender.

Ring-groove and land deposits are affected by lubricant stability, cleanliness, and contamination from the combustion chamber. For instance, the diesel engine encounters a more severe condition from that cause when compared with the gas engine. Unclean air is also a contributing factor.

Oil rings—aside from engine design and mechanical condition, the proper functioning of the oil ring is affected by oil quality, oil contamination, and observance of the proper oil draining schedule.

On some makes or models of engines more difficulty is met with oil ring plugging when compared with other makes or models using the same fuel and oil in the same kind of service. It therefore is obvious that the equipment or design feature undoubtedly has more effect than one might consider as influencing factors.

Piston skirt—cleanliness and the absence of abrasive contaminants are of the utmost importance. Oil stability obviously influences the rate of skirt deposits, which in turn affects clearance and heat transfer from the piston to the cylinder wall and water jacket. Abrasive contaminants accelerate the rate of wear and shorten the life of the piston and cylinder wall.

With a ringless skirt, the oil is changed more frequently over the area below the ring belt. With ringed skirts, the oil is trapped above the skirt ring; hence there is an increase in the duration of exposure of the oil to the higher temperature condition, which in turn may be expected to result in a greater skirt deposit. However, ringed skirts help to retain oil on the skirt, which has the advantage of supplying oil to the wall more quickly following engine starting.

Decreased clearance between the skirt and cylinder wall promotes engine lacquer formation because the smaller clearance retards frequency of change of oil on the skirt; hence increases duration of exposure. Other features accompanying this condition accelerate the rate of engine lacquer deposit.

Piston underhead—carbon flecking from the piston underhead contaminates the crankcase oil, which is also affected by piston material, design and temperatures. Generally, less piston underhead deposit will be found with increased flow of oil to the piston underhead.

There are exceptions to that condition; however, the smaller the volume of oil supplied to the underhead, the greater the troubles associated with "reducing" of the oil with accompanying deposits.

2. Bearings: More frequent or careful checking of the connecting-rod big ends is recommended. Flexing of the rod big ends and other changing to out-of-round dimension measurements are violent offenders on bearing life. Proper fitting of the bearing liner to the back, and especially strict observance of cleanliness are important.

Carelessness will result in increased maintenance costs because of the impairment of heat flow from the liner to the back. Careful examination of the back of the bearing liner generally explains why bearing surface failures have been experienced. Excessive bearing clearances promote an oversupply of oil to the piston assembly, which in turn introduces the probabality of encountering other difficulties.

Since bearing materials which have a higher Brinell under heated conditions are more sensitive to corrosion resulting from objectionable oxidation of oil, it is desirable to use lubricating oils containing effective oxidation inhibitors. Tin-babbitt bearings are recognized as being less sensitive to corrosive action; however, they too will exhibit effects of corrosion when confronted with continued operation at very high temperatures.

Tin-babbit bearings have a better conformability than those with a higher Brinell, and are less sensitive, but they also permit more dirt imbedment. Thus, the harder type of bearings show more abrasion marks in a dirt-contaminated oil. The oil, therefore, should be kept as free as possible from abrasive contaminants by effective air cleaning, oil filtering, and crankcase draining.

Under some operating temperatures and conditions, it may be advisable to use a slightly higher viscosity oil with a slight increase in bearing clearance, where the harder bearings are used because that type is appreciative of a good, fluid cushion. Excessive clearances, however, should definitely be avoided to prevent bearing pound and the consequent out-of-roundness of the crankpin or journal.

3. Crankcase ventilation—This is needed to assist in freeing the crankcase of objectionable products of combustion and depositions that are sometimes encountered from the gum occurring in the oil diluent. Excessive ventilation is not desirable because it increases the exposure of the oil to oxidation. This could introduce a maintenance problem.

4. Valves—Oil stability affects the frequency of necessary valve work. The clearance between the valve stem and guide also affects service requirements. In addition, excessive clearance is often an unsuspected cause of an objectionably high rate of oil consumption. Examination of the underside of the intake valve may indicate when excessive amounts of oil are being drawn up past the valve guide during the suction stroke. Design details associated with the valve-stem guide have also presented valve maintenance problems. The guide should not protrude upward beyond the casting nor should the design follow recessing to the extent of promoting "belling" of the upper part of the guide. Best results are secured by a happy medium.

5. Gear lubrication—There will be no appreciable changes in the general characteristics or qualities of our present gear lubricants. We do expect design improvements whereby a fewer number of gear lubricants will very satisfactorily take care of all requirements. Owing to the increase in unit loading imposed on gears, there is an increasing need for a lubricant of higher oxidation stability and improved film strength. When these two requirements are not compatible, it becomes advisable to take precautionary measures by periodic draining and cleaning of gear cases.

These conditions become more severe with increased speed and load; hence they will be an increasing problem in post-war operations.

6. Chassis lubrication—We may look forward to an appreciable simplification of the number of different lubricants required to lubricate satisfactorily a bus, truck, or passenger-car unit, exclusive of the engine.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between April 10, 1944, and May 10, 1944.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: Lt. Arthur D. Brabbs (S M).

Buffalo Section: Daniel Gurney (M), Clark L. Hastings (M), James C. Kratzer (M), Robert J. Marble (A), B. L. McCarthy (M), F. D. Townsend (M).

Canadian Section: John Oswald T. Beynon (A), Harold Laurence Flynn (A), Thomas W. Hardy (M), George Wakefield Herr (J), Milton H. Hodgson (A), Joseph R. Jagger (A), Frank G. King (A), Frederick William Lewis (J), Oliver H. Lovelace (M), John A. Morphy (A), George Walker Sawin (A), Henry Hotson Wilson (A).

Chicago Section: Wm. F. Arnoldy (A), Fred J. Avery (A), Myres Z. Delp (M), Harold C. Keysor (M), John Taylor Newmark (J), Robert A. Noland (J), Garnet P. Phillips (M), Leland B. Read (M), George F. Soderling (J), Albin J. Stock, Sr. (M), Charles E. Watson (M).

Cleveland Section: Albert Victor Andrews (A), John M. Borland (A), J. Robert Branstetter (J), Burnell O. Burritt (M), Colin Carmichael (M), Kenneth Deuring (J), Harold F. Enyeart (J), Herbert Henry Fink (M), Thomas A. Frischman (M), W. Bryant Gemmill (A), Norman E. Harper (A), Walter G. Hildorf (M), William C. Holmes (A), Harland G. Johnson (J), Oscar Walter Kraemer (A), Leland Melvin (M), Carl L. Meyer (J), F. Ralph Schuricht (J), Roger B. Stafford (A).

Colorado Group: Dale F. Frey (A), Willard H. Jones (A), John F. Van Buskirk (A).

Detroit Section: Delmar E. Ahrens (M), William T. Bean (J), Edward U. Blanchard (M), Arthur L. Bradley (M), Harold L. Brock (J), David Ross Calhoun (A), Bruce D. Caulkins (A), Lt.-Col. R. E. Cook (A), V. A. Crosby (M), Earl K. Cusac (J), Theodore James Deska (J), Harry Elmer Fidler (M), Jos. G. Gagnon (M), Vincent C. Giuliano (J), J. William Glueckert (M), Gene Hirsch (J), J. Luke Hoffman (A), Jack L. Hooven (J), Don A. Howland (A), Joseph Jandasek (M), Richard Bruce Johnson (J), Robert H. Lamb (S M), Frederic A. Leisen (M), Joseph Mack, II (J), Stephen Gabriel Maco (J), Harry J. McGowan, Jr. (A), Dain W. Milliman (M), J. George Penn (M), George A. Pillsbury (A), Michael J. Plawchan (A), William Leon Pringle (M), Michael A. Remondino (M), F. T. Rowland (M), Ray Russell (A), Robert James Saxon (J), Abraham Schachnow (J), Harry G. Schwab (M), Alfred E. Tennant (S M), Jack Harrington Waldner (M), Waldo D. Waterman (M), Louis S. Wood (M), C. Emmett Zwahl (M).

Indiana Section: E. O. Ashley (M), C. Dixon Eagle (M), R. A. Goepfrich (M), Harold H. Lurie (M), (Miss) Ruth Replogle (A).

Kansas City Section: Sebastian Huebner (A).

Metropolitan Section: Albert G. Ambs (M), William James Clark (A), Benjamin A. Cooper (A), Thomas L. Counihan (M), Thomas Preston Darby (A), Putnam Davis (A), Nicholas F. DeMinco (J), Lester T. Dennis (M), George H. Doerries (J), Norman J. Edelmann (A), Albert P. Elebash (M), William Gordon Forbes (A), Harold Gershinowitz (M), Herbert W. Gundersen (J), Samuel J. Hall (M), John Taylor Hayford (J), Norman F. Joy (A), Joseph N. Kosinski (J), Marshall Edward Lenning (A), Robert Lovell (A), George Franklin

Miller, Jr. (J), Robert D. Noyes (A), Peter Hasbrouck Palen (J), Wilbur G. Perriguey (M), Robert W. Reid (M), Orrin E. Ross (M), George Dickinson Thayer (M), Russell S. Thompson (M), Robert G. Troth (J), Harry Van der Gaast (A), Donald J. Wahler (J), Andrew H. Walters (A).

Milwaukee Section: Earl William Becker (J), Craig W. Cannon (J), Oliver J. Chayie (A), Ben. Daneman (M), Lt. (jg) H. M. Dorward (J), Arthur S. Lewis (M), Merrill A. Scheil (M), Paul Schnetzky (A), Donald A. Sutherland (M), Charles W. Wheatley (M).

Mohawk-Hudson Group: Thomas Francis Brothers (A).

New England Section: Levon Frank Charlson (A), Wilmer H. Churchill (M), Lt. Stanley Sawchyn (J), Alfred J. Thibeault (A).

Northern California Section: Robert H. Garnot (A), E. G. Jackson (A), Stanley S. Moore (M), Lester W. McLennan (M), E. V. Parker (A), Roy Milligan Rushton (J).

Northwest Section: Paul John Clements (A), Hearld Engle (A), Milton E. Gaetz (A), Grant James (A), Asa T. Jones (A), Paul E. Rabbach (M).

Oregon Section: Jewell McCoy Lama (A), Ralph L. Lesch (A), Jacob Henry Meyer (A), F. C. Purkeypile (A).

Peoria Group: Ralph Joseph King (J), Richard Wiebe (M).

Philadelphia Section: Gerald Lewis Bader (M), Robert E. Brumbach (J), Charles C. Cupp (A), Lars E. Ekholm (M), Robert L. Sommerville (M), E. W. Timper (A), George I. Tull (M), Arthur J. Williamson (M).

Pittsburgh Section: Thomas E. Eagan (M), Blaine B. Wescott (M).

St. Louis Section: Warren H. Cowdery (A), M. P. L. Love (M), Paul J. Reese (M), Ivan Forest Weeks (J), Ballard A. Yates (M).

Southern California Section: Martyn Alban Andrews (J), Bert Borcherdt (A), Carl A. Braman (A), Harry O. Davis, Jr. (J), James W. Eldridge (A), Joseph H. Famme (M), Edwin G. Gilliland (A), Henry Thomas Graham (A), Frank W. Fink (M), Ezra Hollister (A), Owen C. Kent (M), Walter H. Korff (M), Henry Mezori (A), Donald V. Monroe (A), Hubert R. O'Neil, Jr. (A), Norman C. Parrish (M), Capt. Donald A. Stewart (A).

Southern New England Section: Pierre Henry Bauer (J), Lester A. Lanning (M), Kenneth M. Silcock (M), Victor Frank Strojny (J), Ernest Tucker (J).

Southern Ohio Section: Morton Brooks (J), F. B. Dahle (M), John R. Diver (J), Lt. Sidney M. Kaufman (J), Major Harold F. Marshall (A), Richard E. Moore (J), Theodore F. Olt (M), Horace G. Prall, II (M), Curtis M. Varland (J), Clyde E. Williams (M).

Syracuse Section: Harold Lewis Cullings (J), Carlton H. Rinehart (J).

Texas Section: T. E. Braniff (A), Samuel Parran Card (A), William H. Parish, Jr (A), Hermann Schaar (A), Robert W. Schlumpf (M), Raymond W. Snowberger (A), W. G. Zink (A).

Twin City Group: Gilbert O. Holm (J), LeGrande H. Lull (A).

Washington Section: James R. Hatch (S M), Daniel C. Walser (M).

Wichita Section: Lt.-Col. Vincent Amos (S M), Marvin J. Gordon (J), Marcus B. Herscher (J), Harry Lawrence Reiter (M).

Outside of Section Territory: Audrien J. Bloomberg (A), Lt. Vincent J. Bonina (J), Walter Castles, Jr. (J), Oscar U. Cook (M), C. K. Donoho (M), Wm. R. Fleming (M), Edwin A. Gustafson (J), Ernest W. Horvick (J), Lt. Frank C. Keller (J), Clifford O. Kiser (J), Marion F. Knost (A), M. H. Kraemer (M), Lt. William Randolph Lacefield (J), Harrison F. Lambkin (M), Judson B. Lyles (A), Steve J. Majestic (A), James W. Massey (J), Vern Z. Perry (M), Valton H. Rhodes (A), Edward Vincent Schussler (A), Walter C. Shaw (J), Clarence W. Stanley (J).

Foreign: Christopher Ainsworth Davis (F M), (England), L. B. Russell (F M), (England), Stephen Lloyd Tucker (M), (India), Thomas Robert Norman Whyte (F M), (England), Arthur Wragg (F M), (England).

APPLICATIONS Received

The applications for membership received between April 10, 1944, and May 10, 1944, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Canadian Section: William H. Banfield, William Butcher, Lewis T. Constable, Frederick R. Hilson, Douglas Armstrong Mitchell, Claude M. Nash, Thomas Russell Nutt, Julius E. Prifogle, John Edward Wilson.

Chicago Section: Sal Colacuori, Ralph L. Cotta, Robert Boyd Cottrell, Edward R. Dillehay, Clayton O. Dohrenwend, George William Ely, Michael H. Froelich, Daniel V. O'Leary, Jesse Lowen Shearer, William B. Smethurst.

Cleveland Section: Fred Van Arsdell, Michael Behun, William Emerson Berkey, Ray Emil Bolz, Renke Brunken, Roy W. Collier, Warren John Dubsky, Arthur Charles Echler, Melvin Edward Eisel, Wilbur H. Ficken, Jerry Glaser, Richard Gregg, Anthony Warren Jones, Thomas C. Moore, Frank B. Robb, Henry D. Stecher, James Terry Taylor, Fred Voss, Richard F. Warner, Roger Davies Williams, Frank E. Zamecnik, Morris A. Zipkin.

Colorado Group: Russell T. Anderson, Robert Bruce Miller.

Detroit Section: Frank C. Barrows, Jr., Roy G. Beh, Racy D. Bennett, Harold Y. Coutts, Cyril A. Coyne, Carl J. Eaton, Archie D. McDuffie, Harold F. Mitchel, Gordon E. Moore, Robert Edward Radcliffe, Myron M. Schall, Charles Edward Smith, Robert Stevenson, Jr., Robert Kenneth Thompson.

Indiana Section: Frank Pusey, Joseph S. Williams.

Kansas City Section: J. C. Franklin, Edward Joseph Mills, R. V. North.

Metropolitan Section: George Kerr Anderson, S. C. Atkins, William Filer Burchfield, Miss Doris Thelma Clegg, Lawrence Lyon Goldsmith, John Graf, Homer W. Hard, Richard R. Harold, George D. Holdsworth, Jr., Stanley Maas, Jack C. D. Manes, C. E. Meyerhoefer, James Murtagh Morrison, Kornelius Roisland, Fred E. Ruff, Hamilton S. Sherwood, George R. Simms, Manning Stires, Jr., Lt. Basil S. Warner, Paul Howard Wilkinson, Frederick A. Winzer, Jr., Harrison Wood, Gordon J. Wygant, Edward Zwerdling.

Mid-Continent Section: Joe M. Cowan.

Milwaukee Section: William F. Steffen.

Muskegon Group: Maurice R. Caldwell, James E. Jones, Walter L. Leeds, Leon B. Thomas, Harold Edward Westerlund.

Philadelphia Section: J. R. Alphin, William Robert Fleischman, James O. Johnson.

Pittsburgh Section: Ted Dinger, Charles Joseph Marshall, Ewing B. Rhodes.

New England Section: Leo E. Concannon, Lewis B. Ebbs.

Northern California Section: Harold Anderson, Lt. Paul Joseph Bauer, Joseph T. Cieszko, Dorman C. Elliott, John J. Giusti, William John Long, Jr., T. L. Meiss, Henry Edward Pape, Sr.

Northwest Section: Irvin Lloyd Bedient, John James Bignotti, Harry J. Erickson, Franklin R. Middaugh, Donald Dewitt Morrill, Einar B. Nelson, Rex D. Rowland.

Oregon Section: Earl Andersen.

St. Louis Section: Anthony F. Caraffa, George T. Hammershaimb, Thomas P. McColl, Charles E. Myles, Paul H. Van Osdol, Louis L. Wilson.

Southern California Section: Harold D. Anderson, Leonard E. Austin, Jacobus P. de Bree, Jay Burch Frazelle, William Travis Green, Gerry Gwynne, G. Francis Harbin, Robert P. Hayward, Robert R. Justice, Thomas B. Keenan, Richard D. Maystead, Robert L. Metz, Lawrence N. Michelsen, Paul K. Morgenthaler, John M. Noble, J. Homer H. Overholser, James W. Sinclair, James Brent Wrigley, James Eugene Young.

Southern New England Section: Clyde S. Batchelor, Robert A. Hintermister, Donald J. Jordan, Harry A. Lockwood, J. R. Orgain, Jr., Frank D. Riehle, Earl J. Sambrook.

Southern Ohio Section: Victor Lee Craig, Fred L. Goodell, Robert W. Kinney, Delio Perez, Gustav Scharff.

Syracuse Section: Gerd H. Grieshaber.

Texas Section: H. F. Carrington, Clifton M. Chastain, R. W. Hall, Charles B. Johnson.

Twin City Group: S. Reed Hedges.

Washington Section: August Altigry, Arthur C. Butler, George B. Fraumann, Austin F. Trumbull.

Wichita Section: Norman LeRoy Crook.

Outside of Section Territory: Frank G. Backman, Richard Alfred Bay, Orvil C. Drysdale, Frank M. Hoferer, J. Leonard Love, H. Warren Lufkin, W. J. Phillips, A. Martin Stubel.

Foreign: Col. Tom Leslie Collier, England, P. A. Dyerson, England, Wilfred Kenyon, England, William McClimont, England, Sydney Lewis Morris, New Zealand.

About SAE Members

cont. from p. 24

RAYMOND W. SCHEUBEL is now service engineer for Elastic Stop Nut Corp., Newark, N. J. He had been tool designer for Allied Process Engineers, same city.

D. E. CRABB is no longer representative for the Palnut Co., Irvington, N. J. He is now owner of the Crabb Engineering Co., Detroit, furnishing special wrenches and consulting on problems relating to nuts and bolts.

CHARLES J. KULL has returned from overseas service in the Army Air Forces, and is now with Consolidated Vultee Aircraft Corp., San Diego, as flight service engineer.

CLARENCE A. HUBERT has been made chief engineer of the Farm Tractor Division, International Harvester Co., Chicago. He was formerly in the engineering department of the same division.

KARL O. BOTNEN, formerly an instructor at the Infantry Motor School, Camp Roberts, Calif., may now be reached at A.P.O. 15258. c/o Postmaster, New York City.

WILBUR R. VESTER, U. S. Army, has been transferred from St. Cloud, Minn., to Headquarters Company, Third Battalion, 385th Infantry, Camp McCoy, Wis.

O. E. DAY, placement officer, Pennsylvania Institution for the Instruction of the Blind, Philadelphia, pointed out recently that today there are 214 known economically feasible employment opportunities open to the blind, whereas 100 years ago the only occupation they had was begging. The institution was established more than 100 years ago.

P. NILAKANTAN is now with the Indian Institute of Science, Bangalore, India. He had been an aerodynamicist for Hughes Aircraft Co., Culver City, Calif.

ENSIGN FRED J. GRUMME, formerly president of Avenue Tire & Supply Corp., Indianapolis, is now stationed at Dinner Key, Miami, Fla., in the Naval Air Transport Service, Squadron VR-6.

PAUL C. VYFF, formerly chassis designer, Truck Division, Dodge Division of Chrysler Corp., Detroit, is now with Battelle Memorial Institute, Columbus, Ohio, as research engineer.

CAPT. RAYMOND J. SCHNELLER is now at the Army & Navy General Hospital, Hot Springs, Ark. He was formerly

with the Corps of Engineers at A. P. O. 651, c/o Postmaster, New York City.

DR. GEORGE CALINGAERT, director of chemical research for Ethyl Corp., Detroit, recently received the Tau Beta Pi award, presented annually by the University of Detroit members of Tau Beta Pi, as the outstanding Detroit chemist of the year.

JAMES Y. SCOTT, president of the National Machine Tool Builders Association and president of Van Norman Co., Springfield, Mass., addressed a joint meeting of General Motors master mechanics and plant engineers and a group of machine tool builders at the Hotel Statler in Detroit April 27. He declared, "The Machine tool industry should start right now to redesign and improve its machines – not for post-war purposes, but to expedite war output, reduce the cost of manufacture of war materiel, and reduce the overall cost of the war for each one of us."

SAE members who were among 17 representatives recently named to the new Automobile Industry Advisory Committee of the War Production Board are: **A. E. BARIT,** president, and **S. G. BAITS,** vice-president of Hudson Motor Car Co.; **C. E. WILSON,** president of General Motors Corp.; **D. G. ROOS,** vice-president of Willys-Overland Co.; **HENRY FORD II,** vice-president of Ford Motor Co.; **PAUL G. HOFFMAN,** president of Studebaker Corp.; **K. T. KELLER,** president of Chrysler Corp.; and **J. H. MARKS,** executive vice-president of Packard Motor Car Co.

ENSIGN HOWARD KIRK, JR., has been transferred from Houma, La., to the Naval Air Transport Service, Squadron 2, at Alameda, Calif.

ALBERT J. BLACKWOOD, fuel research engineer for Standard Oil Development Co., Elizabeth, N. J., has been appointed by SAE President **W. S. JAMES** to represent the SAE at the dedication exercises of the new Diesel Engineering Laboratory at North Carolina State College of Agriculture & Engineering, University of North Carolina.

HENRY FORD II, executive vice-president of Ford Motor Co., has been elected to the board of directors of the Automotive Council for War Production, according to **ALVAN MACAULEY,** president of the Council.

SAE members who have received recent promotions within the Armed Forces include: **C. E. BATSTONE,** A. P. O. 528, c/o Postmaster, New York City, to lieutenant colonel; **WILLIAM F. WILLIAMS,** Camp Hood, Tex., to captain; and **JAMES P. McSWEENEY,** Camp San Luis Obispo, Calif., to second lieutenant. **PIERRE S. DE BEAUMONT,** U. S. Navy, has been raised to a lieutenant; and **STEPHEN F. ROSSITER, JR.,** is now a lieutenant (jg).

WILLIAM P. HEADDEN has been appointed assistant manager of the sales engineering department of Standard Oil Co. of N. J. Since early in 1943, he had been supervisor of the fuels and lubricants section of the division.

JOHN P. DODS, director of research and advertising manager for Summerill Tubing Co., Bridgeport, Pa., has been appointed director of advertising and sales promotion for the closely affiliated interests of the Columbia Steel & Shafting Co., the Edgar T. Ward's Sons Co., and Summerill Tubing Co.

GEORGE C. MEINSINGER, formerly transportation specialist in charge of the maintenance program, Office of Defense Transportation, Motor Transport Division, New York City, is now connected with Valentine Express Co., Mount Vernon, N. Y., as superintendent of transportation.

C. A. WITHINGTON, JR. has received a medical discharge from the U. S. Navy, where he was an ensign stationed at Pratt & Whitney Aircraft Engine School, Brainard Field, East Hartford, Conn. He is now with Tide Water Associated Oil Co., Associated, Calif., as automotive research engineer.

MAJOR ROBERT C. HALL has been transferred from Aberdeen Proving Ground, Md., where he was administrative motor transportation officer, to the 62nd Quartermaster Base Depot, Petroleum Division, Headquarters & Headquarters Co., Camp Lee, Va.

Formerly chief engineer for Fuller Mfg. Co., Kalamazoo, Mich., **THOMAS BACKUS** is now with R. G. LeTourneau, Inc., Peoria, Ill., in the same capacity.

HOWARD W. FRITCH, president, Bos-

ton & Maine Transportation Co., and **WILLIAM L. BUTLER**, president, Cincinnati & Lake Erie Transportation Co., Dayton, Ohio, have been appointed to the Intercity Bus Industry Advisory Committee of the Office of Defense Transportation. The committee will act on wartime problems of intercity bus transportation.

A. C. BOOCK, Allis-Chalmers Mfg. Co., Springfield Works, Springfield, Ill., has been changed from chief design engineer to assistant chief engineer of the company.

Ab Jenkins

AB JENKINS, formerly mayor of Salt Lake City, Utah, is now a consultant for the Ninth Service Command, U. S. Army, headquarters of which are at Ft. Douglas, Utah.

HERMAN L. PHILIPSON, JR., previously a student at A. & M. College of Texas, is now in the U. S. Army, stationed at Fort Benning, Ga.

JOHN H. PRESTON, formerly field engineer for Faber Laboratories, Inc., New York City, is now connected with the Walworth Co., also in New York City, in the same capacity.

T. C. KUHLMAN is now with Allis-Chalmers Mfg. Co., West Allis, Wis., as a consultant on precision castings. He had been research engineer for Miller Engineering Corp., Detroit.

Previously layout draftsman for Wright Aeronautical Corp., Paterson, N. J., **PALMER D. EVANS** has entered the U. S. Navy.

MAJOR K. E. STALEY has been transferred from the Ordnance Base in Pomona, Calif., to A. P. O. 4940, c/o Postmaster, New York City.

FRANKLIN M. ARNALL, U. S. Army, may now be reached at Headquarters Company 1009 Engineers, Oil Field Battalion, Santa Anita, Arcadia, Calif. He was formerly studying at Rose Polytechnic Institute, Terre Haute, Ind., under the Army student training program.

L. P. SAUNDERS, chief engineer of Harrison Radiator Division, General Motors Corp., Lockport, N. Y., has been elected national treasurer for the American Society of Heating & Ventilating Engineers for the current year, having just completed a three-year term as national counselor. He has also been reappointed for a third term to the subcommittee on heat exchangers for aircraft for NACA.

H. W. BARLOW, head of the Department of Aeronautical Engineering, A. & M. College of Texas, and **GEORGE HADDAWAY**, editor of Southern Flight, were cochairmen of the Texas Aviation Planning Conference held at College Station, Tex., May 1-3. Other SAE members who participated in the program included: **PETER ALTMAN**, engineering consultant, Detroit; **COL. ROSCOE TURNER**, Turner Aeronautical Corp.; **ANDREW W. DE SHONG**, North American Aviation, Inc.; **W. WILBUR SHAW**, Firestone Aircraft Co.; **ROSS A. PETERSON**, North American Aviation, Inc.; and **A. T. COLWELL**, Thompson Products, Inc.

MAJOR R. H. REID has been transferred from Governors Island, N. Y., where he was chief of the armament maintenance section, to the 243rd Ordnance Battalion, Mississippi Ordnance Plant, where he is commanding officer.

RALPH H. UPSON is now chief aeronautical engineer for a War Production Board research project at the College of Engineering at New York University. This project seeks to develop wind as a source of electric power on a large scale to supplement our natural resources for war production. Mr. Upson, a fellow of the Royal Aeronautical Society, had been chief aeronautical engineer for the War Production Division of H. J. Heinz Co., Pittsburgh.

DAVID T. EVANS, retiring chairman of the SAE Wichita Section, is now located at Big Spring, Tex., serving Cosden Pet-

SAE student members newly engaged in engineering work at various production plants throughout the country include:

	Formerly at	Employed by
JOHN MICHAEL CONSIDINE	Massachusetts Institute of Technology	Wright Aeronautical Corp.
JAMES R. COLLINGS	General Motors Institute	Allison Division
LEONARD G. MAZEL	Stevens Institute of Technology	Lockheed Aircraft Corp.
BERTRAM A. CHESLER	Chrysler Institute of Engineering	Chrysler Corp.
EDWARD J. DONLEY	Lawrence Institute of Technology	Air Products, Inc.
JOHN RANDOLPH HAYES	General Motors Institute	Allison Division
JAMES W. SMELKER	Ohio State University	North American Aviation, Inc.
SEYMOUR J. DEITCHMAN	College of the City of New York	National Advisory Committee for Aeronautics
IRWIN J. WEISENBERG	Ohio State University	Lockheed Aircraft Corp.
LLOYD G. LUDWIG	Ohio State University	Douglas Aircraft Co., Inc.
EDWARD W. OTTO	Iowa State College	National Advisory Committee for Aeronautics
JAMES C. HEAP	Illinois Institute of Technology	Standard Oil Co. of Ind.

troleum Corp. as manager of its lubricants department. Prior to taking this position, Mr. Evans was with the U. S. Army Air Forces in the Inspection Section of the Fuel, Lubricants & Chemical Unit of the Midwestern Procurement District. For a number of years Mr. Evans headed the lubricants department of the Globe Oil Co.

RAY BITTNER in now office manager for Moore Equipment Co., Stockton, Calif. He was formerly associate production supervisor, U. S. Army Air Forces, Materiel Command, Wright Field, Dayton, Ohio.

F. A. DOBSON, who had been project engineer in charge of glider design for Waco Aircraft Co., Troy, Ohio, is now with Aeronautical Products, Inc., Detroit, as chief aeronautical engineer.

Previously an instructor at the Chicago Navy Pier, **MICHAEL. J. KOZAK** is now a motor machinist mate first class stationed at the diesel engine school at Gulfport, Miss.

PIERRE SCHON, formerly experimental engineer for Marmon-Herrington Co., Inc., Indianapolis, is now associated with General Truck Co., sales and service subsidiary of General Motors Corp., in Jacksonville, Fla. He had been connected with the Yellow Truck & Coach Division of GMC for several years before joining Marmon-Herrington.

A. H. YATES is now a lieutenant commander in the U. S. Navy, and may be reached at the Post Graduate School, U. S. Naval Academy, Annapolis, Md.

Previously assistant superintendent of maintenance of Canadian Pacific Air Lines, Ltd., St. James, Man., **J. HARDMAN** is now employed in the inspection department of Trans-Canada Air Lines, Winnipeg.

GEORGE H. LANCASTER, who had been assistant project engineer for Jacobs Aircraft Engine Co., Pottstown, Pa., has entered the U. S. Navy as a lieutenant (jg) and is stationed at Fort Schuyler, The Bronx, N. Y.

MAJOR MURTEN G. HIETT has been transferred from A. P. O. 724, Seattle, Wash., to A. P. O. 722, Minneapolis.

HAROLD W. THOMAS has been promoted from test pilot to chief experimental test pilot for Curtiss-Wright Corp., Airplane Division, Buffalo Plant No. 2.

Formerly director of planning, estimating and design, **THOMAS F. MORRISSEY** has been named chief engineer for Lights Inc., Alhambra, Calif.

EDMUND S. DAVENPORT, formerly metallurgy supervisor for U. S. Steel Corp., Kearny, N. J., is now assistant to the vice-president for U. S. Steel Corp. of Delaware, Pittsburgh.

MAC SHORT, SAE past-president and vice-president of Lockheed Aircraft Corp., Burbank, Calif., has been appointed a member of the War Metallurgy Committee of the National Research Council, representing the aircraft industry on the West Coast. This committee, at the request of the Ordnance Department, has undertaken projects which have to do with armor plate and gun steels.

HECTOR RABEZZANA, chief engineer of the spark plug department of AC Spark Plug Division of General Motors Corp., Flint, Mich., was lauded by 200 executives and co-workers at a dinner given in his honor on the occasion of his retirement because of ill health. He served with AC for 28 years. Mr. Rabezzana, at one time technical director of Isotta Fraschini, is an outstanding authority on spark plugs. He is a member of the SAE Ignition Research Committee.

SAE members who have been named to the new ASTM technical committee on metal powders and metal powder products include: **A. J. LANGHAMMER,** Chrysler Corp.; **F. R. HENSEL,** P. R. Mallory & Co., Inc.; **R. W. WARING,** Sperry Gyroscope Co., Inc., and **J. R. NURNEY,** S. K. Wellman Co.

FRANK P. FRANKFORD is now superintendent of equipment for Worcester Street Railway Co., Worcester, Mass. He was formerly general superintendent of shops for Fifth Avenue Coach Co., New York City.

O. G. BLOCHER, Consolidated Vultee Aircraft Corp., has been transferred from the Stinson Division, Wayne, Mich., where he was executive engineer, to the Stout Research Division, Dearborn, where he is now chief engineer.

LOUIS LINDENBAUM, Wright Aeronau-

tical Corp., Paterson, N. J., has been promoted from junior liaison engineer to senior liaison engineer.

FRANK L. SEESOCK, who is employed by McDonnell Aircraft Corp., has moved from the St. Louis plant, where he was aeronautical weight and balance engineer, to the municipal airport at Memphis, Tenn., where he is project weight engineer.

ALDO B. GALVANONI, Wright Aeronautical Corp., has been changed from flight engineer to field engineer.

JEROME A. CHURCH, who had been development engineer for Bendix Aviation Corp., South Bend, Ind., is now engineering representative for Stromberg carburetors, same company.

VINCENT MOORE is now project engineer for Wright Aeronautical Corp., Paterson. He had been assistant project engineer for the same company.

SAE members who have received recent changes in company status are: **HERMAN L. STIEBER,** Wright Aeronautical Corp., Paterson, N. J., from assistant to the chief inspector to quality manager, Paterson Plants; **RICHARD A. HAMEISTER,** Holley Carburetor Co., Detroit, from junior engineer to assistant project engineer; **V. A. CROSBY,** Climax Molybdenum, from metallurgical engineer to head of the Sales & Service Division of the Detroit office; **ALVIN N. COVER,** from Solar Aircraft Co. in San Diego to the Des Moines, Iowa branch; **A. J. DEMPSEY,** Continental Aviation & Engineering Corp., from project engineer in Muskegon, Mich., to chief test engineer in the Detroit branch; **DONALD V. BARKER,** special representative of the National Accounts Division, Studebaker Corp., has been transferred from the New York City branch to the one in South Bend, Ind.; **J. H. CARPENTER,** Lycoming Division, Aviation Corp., Williamsport, Pa., from assistant project engineer to project engineer; **HERBERT H. FINK,** product design engineer for B. F. Goodrich Co., has been transferred from the Boston to the Akron plant; **ORRIN E. ROSS,** Eastern Aircraft Supply Co., New York City, from engineer to partner; **A. D. McLEAN,** Kenworth Motor Truck Corp., Seattle, Wash., from design draftsman to resident engineer, Yakima branch; **CRAIG H. EDWARDS,** Bendix Aviation Corp., from West Coast engineering representative, Stromberg Carburetor Division, North Hollywood, Calif., to Bendix Products Division at South Bend, Ind.; **JOHN J. POWELSON,** Standard Oil Co. of N. J., from the motor vehicle department to the General Automotive Division, where he is assistant to the manager; **T. W. SIERS,** Canadian Pacific Air Lines, Ltd., has been transferred from Montreal to Winnipeg; **WILLARD VANDER VEER,** Thompson Products Inc., from chief test operator at the Euclid, Ohio, plant, to service parts engineer at the Cleveland branch; **FREDERICK P. McLOUGHLIN,** Glenn L. Martin Co., Baltimore, from armament engineer to senior test engineer; **KENNETH W. SELF,** Consolidated Freightways, Inc., Oakland, Calif., from assistant shop foreman to shop foreman; **RAY SOPHIAN,** field engineer for Wright Aeronautical Corp., has been transferred from Paterson, N. J., to Wright Aero Ltd., Los Angeles; **FRANCIS ANGUS KIMMONS,** Curtiss-Wright Corp., Propeller Division, Caldwell, N. J., from senior field service representative to regional supervisor, field service department; **HARRY L. KELLER,** engineering department of Buick Motor Division, General Motors Corp., has been transferred from Flint, Mich., to the Melrose Park, Ill., plant; **NORMAN H. WERNER,** Ed Werner Transfer & Storage Co., Pittsburgh, Pa., from estimator to assistant manager; **C. L. BROSSEAU,** from the subcontract department of Mack Mfg. Corp., Allentown, Pa., to Mack-International Motor Truck Corp., Chicago; and **C. R. URSELL,** Pan American Airways System, Latin American Division, from design engineer in the Brownsville, Tex., branch, to structural project engineer in Miami, Fla.

OBITUARIES

C. O. Miniger

C. O. Miniger, founder and chairman of the board of Electric Auto-Lite Co., died April 23 at the age of 69. After engaging in various enterprises, he organized the Electric Auto-Lite Co. in 1911 with himself as secretary and treasurer. Three years later, when John N. Willys became associated with the firm, Mr. Miniger was elected president and general manager – a post he held until ill health forced him to retire several years ago. Today, the concern has 23 plants in this country and Canada.

Mr. Miniger had been connected with the Willys Corporation as vice-president, as a member of the executive committee and as one of the receivers appointed in 1921. At the time of his death, he was serving as chairman of the board of the Bingham Stamping Co., and was an active director of City Auto Stamping Co. and the Air-Way Electric Appliance Co.

F. W. Gurney

F. W. Gurney, chairman of the board of directors, Marlin-Rockwell Corp., died recently. He was 77 years old. Well known for his development of Gurney bearings and processes, Mr. Gurney spent much of his career in the application of ball bearings to automobiles, and was also interested in machine designing and building. A graduate from Oberlin College, he was an active member in the Society. He was vice-chairman of the SAE Ball and Roller Bearings Division in 1921 and chairman from 1922-1925. He was also chairman of the Sectional Committee on Ball and Roller Bearings that was appointed by SAE and ASME to deal primarily with general industrial and international bearing standardization.

William P. Deppé

William P. Deppé, 71, died March 6. Famous for his superheated dry gas and gas engines, Mr. Deppé was president of the former Deppé Motors Corp., and railway official of the New York Central Lines in Cincinnati, and later in the passenger department in St. Louis. At one time he had an active interest in the submarine coal mines of Mabon, Nova Scotia, where as vice-president and general manager of the Mabon & Gulf Coal Co. he redeemed the valuable "diamond" coal mines which had been wrecked by striking miners under the sea.

Because of his success in making volatile gasoline from low grade heavy oils, he was made a member of the Royal Society of Arts and Sciences of England. He was also a member of the American Chemical Society and the American Petroleum Institute.